DOCUMENT RESUME

ED 250 467 CE 039 896

AUTHOR Mein, Jake; And Others
TITLE Machine Trades. A Competency Based Articulated Curriculum.
INSTITUTION Indian Hills Community Coll., Ottumwa, Iowa.
SPONS AGENCY Iowa State Dept. of Public Instruction, Des Moines.
PUB DATE 82
NOTE 164p.; For related documents, see CE 039 894-899. Developed in cooperation with Merged Area XV High Schools.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC07 Plus Postage.
DESCRIPTORS *Articulation (Education); College School Cooperation; *Competence; *Competency Based Education; *Course Content; Curriculum Development; Curriculum Guides; Educational Mobility; Educational Planning; Educational Policy; Institutional Cooperation; Job Analysis; *Job Skills; *Machine Tool Operators; Machine Tools; Occupational Information; Program Content; Secondary Education; Student Evaluation; Task Analysis; Transfer Policy; Two Year Colleges; Vocational Education

ABSTRACT

This document is a competency-based curriculum guide designed to promote articulation in machine trades vocational education programs between and among secondary and postsecondary institutions in the Indian Hills Community College and Merged Area XV high schools in Iowa. The guide is organized in 11 sections. The first six sections provide background information about the articulation project, the audiences served and competencies developed, testing procedures, and provisions for transfer of credits. Safety precautions for the machine shop are discussed in the seventh section, while sections VIII and IX, which make up the greater part of the document, detail the competencies needed by entry-level machine operators and the enabling tasks needed to become proficient in the competencies. Each competency consists of three parts that, when used in combination, provide a detailed outline of major tasks that a student must accomplish to reach one or more previously stated student outcomes. The three parts are the task that the student must accomplish, the conditions under which the student must demonstrate the skills, and standards of acceptable performance. Information sheets illustrated with line drawings are included in the competency statements. The final two sections of the guide consist of a student competency record form and a list of job titles available in the local area keyed to relevant competencies. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

IA8213101

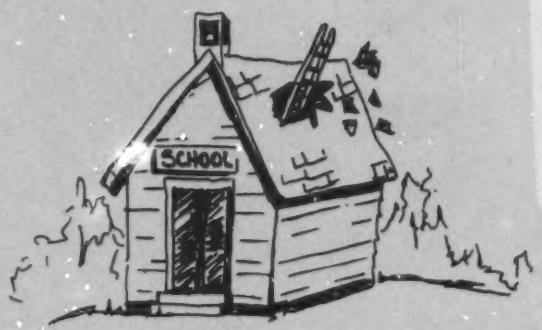
ED250467

Indian Hills Community College
in cooperation with
Merged Area XV High Schools
presents

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.



"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

D. Gathen

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

A COMPETENCY BASED ARTICULATED CURRICULUM FOR

MACHINE TRADES

A pilot project undertaken in cooperation with The Iowa State Department of Public Instruction

CE039896

TABLE OF CONTENTS

I. Statement of Authorship 1

II. Introduction 3

III. Acknowledgements 5

IV. Project Policy Statement 7
Definition of Articulation 8
Audiences Served 8
Competencies Developed 8

V. Testing Procedures 9

VI. Transfer of Credit 11

VII. Safety Precautions For the Machine Shop 13

VIII. Competencies 17

Lathe Level I 21
Lathe Level II 26
Lathe Level III 32
Lathe Level IV 37

Milling Machine Level I 42
Milling Machine Level II 47
Milling Machine Level III 52
Milling Machine Level IV 57

Drill Press Level I 64
Drill Press Level II 69
Drill Press Level II 73

Shaper & Planer Level I 77
Shaper & Planer Level II 82
Shaper & Planer Level III 86
Shaper & Planer Level IV 91

Grinding Machines Level I 97
Grinding Machines Level II 102
Grinding Machines Level III 107
Grinding Machines Level IV 112

TABLE OF CONTENTS
(CONTINUED)

IX.	Enabling Tasks		116
	Lathe	Level I	118
	Lathe	Level II	119
	Lathe	Level III	120
	Lathe	Level IV	121
	Milling Machine	Level I	122
	Milling Machine	Level II	123
	Milling Machine	Level III	124
	Drill Press	Level I	125
	Drill Press	Level II	126
	Drill Press	Level III	127
	Shaper and Planer	Level I	128
	Shaper and Planer	Level II	129
	Shaper and Planer	Level III	130
	Shaper and Planer	Level IV	131
	Grinding Machines	Level I	132
	Grinding Machines	Level II	133
	Grinding Machines	Level III	134
	Grinding Machines	Level IV	135
X.	Recommended Student Competency Record		140
XI.	Job Opportunities		140

I. STATEMENT OF AUTHORSHIP

MACHINE OPERATOR

The Director of this project is indebted to the following persons for their exemplary contributions to this publication. Compilation of this model reflects individual faculty preferences. Attempts to reproduce the effort with different faculty will likely produce variances in style.

AUTHORS

Jake Mein
Indian Hills Community College
Industrial Airport
Bldg. #60
Ottumwa, Iowa 52501

515 683-5215

Carl Lawrence
Ottumwa High School
501 East Second Street
Ottumwa, Iowa 52501

515 683-4444

Jerry Ostrum
Indian Hills Community College
Industrial Airport
Bldg. #60
Ottumwa, Iowa 52501

515 683-5215

PROJECT COORDINATOR

Tom Williamson
Articulation Project Coordinator
Indian Hills Community College
Grandview and Elm
Ottumwa, Iowa 52501

515 683-5125

II. INTRODUCTION

INTRODUCTION

Indian Hills Community College, the twenty-six Local Education Agencies of Merged Area XV, Southern Prairie Area Education Agency XV (AEA), and the Iowa State Department of Public Instruction share a common commitment to offer current vocational opportunities to Iowans. This commitment has been demonstrated by undertaking a competency based Vocational Articulation project. In an effort to improve opportunities for students of secondary and post-secondary programs in Merged Area XV, those institutions mentioned above endeavored to create a solution to curricular problems such as redundancy, and gaps in subjects, occurring between secondary and post-secondary institutions. On October 21, 1981, an effort toward modifying existing curriculum was initiated by the Iowa Department of Public Instruction, Indian Hills Community College, Southern Prairie Area Education Agency XV, and all local Education Agencies in Merged Area XV. Persons instrumental in conceiving the project include: Jim Athen, Director of Career Education and Dr. Howard Hammond, Director of Teacher Certification, State Department of Public Instruction; Dr. John Van Ast, Associate Professor of Higher Education, Iowa State University; Ed Kuntz, Principal of Ottumwa High School; and Dr. Stephen M. Poort, Dean of Instruction, Indian Hills Community College.

III. ACKNOWLEDGEMENTS

ACKNOWLEDGEMENTS

I am especially indebted to the members of the task force who provided sound counsel and strong support throughout the duration of this 24 month project. Task force members serving on behalf local secondary schools were: Dave Hotchkiss, Drafting (Ottumwa); Carol Gullion, Secretarial (Ottumwa); Ron Langgin, Electronics (Ottumwa); Keith Wells, Agriculture (Fairfield); Scott Maxom, Agriculture (Blakesburg); Harley Hecker, Welding (Ottumwa); and Carl Lawrence, Machine Shop (Ottumwa). Serving as task force members on behalf Indian Hills Community College were: Carl Moore, Drafting; Linda Poli and Connie Schmitz, Secretarial; Jerry Harshman, Electronics; Charles Rosenbalm and Dave McQuoid, Welding; and Everett Pilkington, Agriculture. Garland Ashbacher, Kirkwood Community College, served in support of the Agriculture model.

A special word of appreciation is due the following persons for their assistance in shaping the final form of this project. They are: Ed Kuntz, Principal and Ed Meyer, Vocational Director, Ottumwa High School; Don Smith, Consultant, State Department of Public Instruction; Ray Wingate, Educational Services Director, (AEA); Chuck Lawson, Vocational Director, Indian Hills; Bob Allison, Business Technologies Chairperson, Indian Hills; Betty Guest, Project Secretary; and Lew Debo and Shannon Vesely, Editors. Recognition should also be given the selected private sector persons who helped on two occasions to reaffirm those competencies developed by task force members for each of the six vocational curriculum models.

It was our purpose to put forth a road map on the articulation process that could be emulated by interested educators elsewhere in Iowa. The effort described in this model is one of the six end products of the total articulation process. Should the reader desire a copy of the final report he/she should contact Jim Athen, Director of Career Education, State Department of Public Instruction, Grimes State Office Building, Des Moines, Iowa 50319.

Stephen M. Poort, Ed.D.
Project Director

Thomas Williamson, M.A.
Project Coordinator

IV.

PROJECT POLICY STATEMENT
DEFINITION OF ARTICULATION
AUDIENCES SERVED
COMPETENCIES DEVELOPED

PROJECT POLICY STATEMENT

DEFINITION OF ARTICULATION

Articulation, as defined in this project, is the sequential development of occupational competencies in a non-repetitive fashion building from simple to more complex competencies.

This project provides an articulated system for coordinating the preparation of students to enter the world of work. It is intended to: (a) assure the quality of training at various levels; (b) eliminate repetition and learning gaps as students move from one level of mastery to the next; (c) provide uniform methods of measuring acquired skills of students in various competencies; (d) record those measurements for the benefit of students, prospective employers, and educators who would improve quality of curriculum; (e) encourage employers to match personnel qualifications to specific job requirements; and (f) enable beginning students to understand what they are expected to learn.

AUDIENCES SERVED

Project materials are designed for use by any or all of the following educationally-related groups: students, teachers, administrators, counselors, private sector representatives, and college registrars. Applications vary in accordance with user needs; however, specific suggestions on recommended usage can be found in the body of the final report.

COMPETENCIES DEVELOPED

Competencies have been developed for each of the six vocational programs and articulated from the secondary to the post-secondary level. A separate listing of those competencies can be found in the body of each of the models.

V. TESTING PROCEDURES

TESTING PROCEDURES

The following represents those testing procedures in place as of June 30, 1984.*

	Test on Secondary Level	Test on Post-Secondary Level	Competency Record Maintained
AGRICULTURAL OCCUPATIONS	X		X
BUSINESS OCCUPATIONS	OPTIONAL	X	X
DRAFTING		X	X
ELECTRONIC TECHNOLOGY		X	X
MACHINE TRADES		X	X
WELDING OCCUPATIONS		X	X

For answers to more specific questions regarding testing competency based articulated curriculum, participants are encouraged to contact any of the task force representatives identified on the authors' page of this model.

*Additional information such as individual course listings can be provided by contacting any of the authors of this curriculum model as well as the college registrar.

VI. TRANSFER OF CREDIT

TRANSFER OF MACHINE SHOP CURRICULUM

SECONDARY

COMPETENCIES	SEMESTER CREDITS	CATALOG NO.	COURSE
1,2,3,4,5	(180 hrs.) 3	252	Lathe
1,2,3,4,5	(180 hrs.)		Milling Machine
1,2,3,4,5	(60 hrs.)		Shaper
1,2,3,4,5	(60 hrs.)		Drill Press
1,2,3,4,5	(60 hrs.)		Surface Grinder

POST SECONDARY — VOCATIONAL MACHINE SHOP

1,2,3,4,5	317 hrs.	MAD12U	Lathe
1,2,3,4,5	317 hrs.		Milling Machine
1,2,3,4,5	108 hrs.		Shaper
1,2,3,4,5	108 hrs.		Drill Press
1,2,3,4,5	108 hrs.		Surface Grinder

TOTAL 6 credits

VII. SAFETY PRECAUTIONS FOR THE MACHINE SHOP

SAFETY PRECAUTIONS FOR THE MACHINE SHOP

Safety is extremely important in all Machine Trades tasks. Operators and other persons in the work area should be constantly aware of hazards that can cause injuries to people and damage to equipment and products.

General rules for safety in teaching machine shop are listed below. Specific instructions for the safe operation of machines are given in those sections of the manual that relate to each particular machine.

GENERAL SAFETY INSTRUCTIONS

1. You are permitted to work with machines and equipment only after you have been given safety instructions. Each machine is dangerous if operated incorrectly.

2. You are not permitted to work with any machine or equipment before, during, or after class hours unless you have received permission and there is an instructor in the shop. Should you be injured, a qualified instructor would be near to assist you immediately.

3. Never remove guards or safety devices from any machine. If for any reason a safety guard is not in place, or if the machine is defective in any way, the machine must not be used until corrections are made by the proper authorities. Tag the defective machine so other students will not use it and notify your instructor.

4. Obtain your instructor's permission before starting any job or operating any power equipment. He/she may make suggestions that will prevent an accident.

5. Before turning on the power, pick up loose tools and make certain that all other students are clear of the machines or equipment.

6. Clean, oil, or adjust machinery only when it is stopped; otherwise, some part of your body, clothing, or equipment may be caught by the moving parts, causing injury.

7. Only you, as the operator, should start and stop a machine. Once the machine starts, one person must be in control and decide exactly what is to be done.

8. Only the operator and instructor are permitted within the defined safety zone around any machine. Crowding around a machine may distract the operator's attention and cause injury.

9. Start your machine and stay with it until you have turned it off. Use caution when approaching any power machine and be aware of any part that is in motion.

GENERAL SAFETY INSTRUCTIONS (CONT'D)
Page 2

10. Do not distract the attention of any student operating a machine. In event anyone wishes to speak with you, discontinue your work and stop the machine while you are talking. Safe operation of a machine requires concentration.

11. Remove all tools and other objects from the machine and check adjustments before turning on the power. Unless all adjustments on the machine are securely locked in place before it is started, the vibration may cause these settings to slip or change position. Vibrations also may cause tools or other loose objects to be drawn into the moving parts, risking personal injury and damaging equipment.

12. Stop any machine before wiping it with rags in order to prevent catching them in the moving parts.

13. Never stand in direct line with the "throw" of any machine. If a saw should break or a machine become overloaded, if the stock were not held securely, or if a knot or large sliver should come loose, these objects could be thrown out with terrific force.

14. If you are engaged in any activity in which eye hazards, such as flying particles, corrosive substances, or blinding light exists, you must use suitable eye protection, such as goggles or a face shield. Don't gamble with your eyesight.

15. Before starting to work, tuck in loose clothing and dangling neckties. Use a cap for long hair. These items could be caught in moving parts and draw your hand or body along with them.

16. Become thoroughly familiar with the school's fire alarm, fire drill procedures, and fire exits. In case of a fire alarm, turn off all power and flames, walk quietly to the nearest exit, and follow your instructor's directions.

17. To prevent spontaneous combustion, keep all rags containing oil, gasoline, paint, solvents, or any other combustibles in covered metal containers.

18. Never use gasoline near flames, a source of sparks or radiators.

19. If you do not feel well, check with the instructor before using any equipment.

20. Keep the floors, aisles, and passageways clear of stock, materials, scraps, tools, and equipment. Place all scrap materials or cuttings in the scrap box provided. Good housekeeping helps prevent accidents.

BEST COPY AVAILABLE

GENERAL SAFETY INSTRUCTIONS (CONT'D)
Page 3

21. Clean up immediately any liquids or grease spilled on the floor in order to reduce fire danger and prevent slips and falls.

22. Do not place articles on window sills, stepladders, or other high places where there is a possibility of them falling on someone.

23. Safety procedures prohibit playing, clowning, running, and participating in non-productive activities. "Horseplay" is extremely dangerous. A playful push may cause a fall, resulting in injury from contact with the edge of a bench or part of a machine or other equipment.

24. Consider it your duty to call your instructor's attention to anyone you see violating a safety rule or good safety practice. You may prevent serious injury to yourself or your classmates. In addition, report any defective tool, equipment, or unsafe condition.

25. Inform your instructor at once in case of an accident, however slight. Infection may result from any uncared for cuts and scratches.

26. Always keep your mind on your work. Inattention may result in a serious accident and years of regret.

27. To lift heavy objects from the floor, squat down and keep your back nearly vertical; use the leg muscles in lifting. This procedure will help prevent an injury. Do not attempt to lift any object heavier than you can handle easily.

28. Carry long pieces of material very carefully. Good safety practices require that pieces six feet or more in length should be carried by a student at each end. Short pieces may be carried by one student if he/she keeps the front end high enough to avoid striking anyone.

29. Do not move any equipment or material unless you can see clearly that there are no obstacles in your path.

BEST COPY AVAILABLE

VIII. COMPETENCIES

COMPETENCIES

Each competency consists of three parts that, when used in combination, provide a detailed outline of a major task that a student must accomplish to reach one or more previously-stated student outcomes. Competencies are described as follows:

a. Task - what the student must accomplish to demonstrate ability to perform the job outlined.

b. Conditions - A description of the circumstances under which the student demonstrates the skill. Usually included are:

   1. time allowance;
   2. tolerances allowed;
   3. references utilized;
   4. specific materials and tools needed;
   5. work location (if other than school site);
   6. and, other limitations unique to the task.

c. Standards of Acceptable Performance - Criteria described that constitute acceptable performance.

   These criteria must:

   1. be compatible with the task and condition;
   2. evaluate all components of the conditions;
   3. include the percentage of responses that must be correct if the competency is primarily cognitive;
   4. and, specify the standard of the criteria.

Competencies needed for initial employment are represented in this model. They are neither designated nor described by grade level. A student may complete all competencies available at a school subject to learning capability and time limitations. Competencies listed in this model do not attempt to represent all those taught at any participating secondary or post-secondary school.

LEVEL I

COMPETENCIES IN OPERATION OF ENGINE LATHES

Safety

Before beginning the demonstration of competencies in using an engine lathe, the student shall:

I. Review the general safety instructions for Machine Trades.

II. Review the specific safety instructions for lathe operation, listed below.

Lathe Safety Instructions

1. Use caution when turning long, narrow bar material which extends beyond the end of the lathe. Support it in a manner that will prevent the material from whipping and tie a piece of cloth to the end of the stock to warn other students.

2. Exercise care while setting up work between centers on a lathe. Before turning on the power, make certain that the tail stock is securely clamped to prevent the work from flying out.

3. Use chuck blocks or some other form of support while mounting the chuck or removing it from the spindle so as to keep the chuck from dropping on the fingers or feet.

4. When the lathe is in operation, do not touch the work with the hands, wipe it with a rag, encircle it with a piece of emery cloth, or measure it with a micrometer. These are all dangerous practices.

5. Keep the gear cover closed while operating the lathe to prevent hands or clothing from being caught in the moving parts.

6. Rotate the chuck or face plate one complete circle before turning on the power to determine if there is proper clearance of the lathe bed.

7. Remove the cutting tool from the tool holder and move the compound rest toward the tail stock before filing and polishing, to prevent injury to hands and arms.

8. Remove the chuck key or wrench immediately after using it to prevent its flying out when the machine is started.

9. Stop the power feed before the lathe tool reaches the jaws of the chuck. This procedure will prevent the tool bit from digging into the work and causing breakage or flying particles.

10. Do not handle the curling chips of metal while the lathe is in motion. The jagged edges of the metal chips may cut the fingers, or they may catch the hand and draw it into the work. Use a brush to remove small chips and use a small bar for long, curled chips.

Lathe Safety Instructions (Page 2)
Page 2

11. Students will wear safety glasses at all times in the shop.

12. His/her shoes will be of leather construction with a composition sole and heel of sufficient thickness so shavings will not penetrate them.

13. He/she will wear the suitable clothing and keep the shirt tucked in under the belt and sleeves rolled above the elbows. Neckties are not permitted.

14. His/her hair, if it is beyond shoulder length, must be covered with a cap or hair net.

15. He/she will not wear any loose hanging jewelry or neck chains. Rings, watches or bracelets will not be worn while operating a machine.

BEST COPY AVAILABLE

LEVEL I

COMPETENCY NO. 1

LATHE

TASK OPERATION SHEET

1. Objective:

To develop basic skills in diameter turning facing, center-drilling, drilling, reaming, chamfering, knurling and lathe safety.

2. Equipment:

Engine lathe

3. Material:

Four-inch piece of one-inch round steel bar stock

4. Tools required:

A. 0 to 1 inch outside diameter micrometer
B. 6-inch machinist scale
C. Right-hand turning tool
D. 10 inch flat machine file
E. #2 Center drill
F. 31/64 drill
G. ½" ream
H. Chamfer tool
I. Knurling tool
J. Left-hand turning tool

5. Reference:

Operational sequence sheet
Print sheet
Safety sheet

6. Information

Student may request demonstration by instructor or "buddy" student for a first-piece part. Should his/her first part be out of print, he/she will be allowed to make several parts until they conform to print dimensions. However, once the part has been given to the instructor for grade and a request is made for remake there will be 5 points substracted from the final grade. All tooling will be furnished.

7. Safety:

All students will receive detailed instructions on the safe operations of the engine lathe.

LEVEL I

MACHINE SHOP

LATHE

COMPETENCY NO. 1

TASK:

To produce a knurled plug.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up lathe and face, center drill, drill and bore the part to print dimensions.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load part in machine and tools in holders.
3. Load part in 3-jawed chuck and perform all operations to print specifications in a safe and efficient manner.
4. Clean work area and machine, returning all tools to proper storage area.

LEVEL I

LATHE

COMPETENCY NO. 1

TASK OPERATIONAL SEQUENCE SHEET

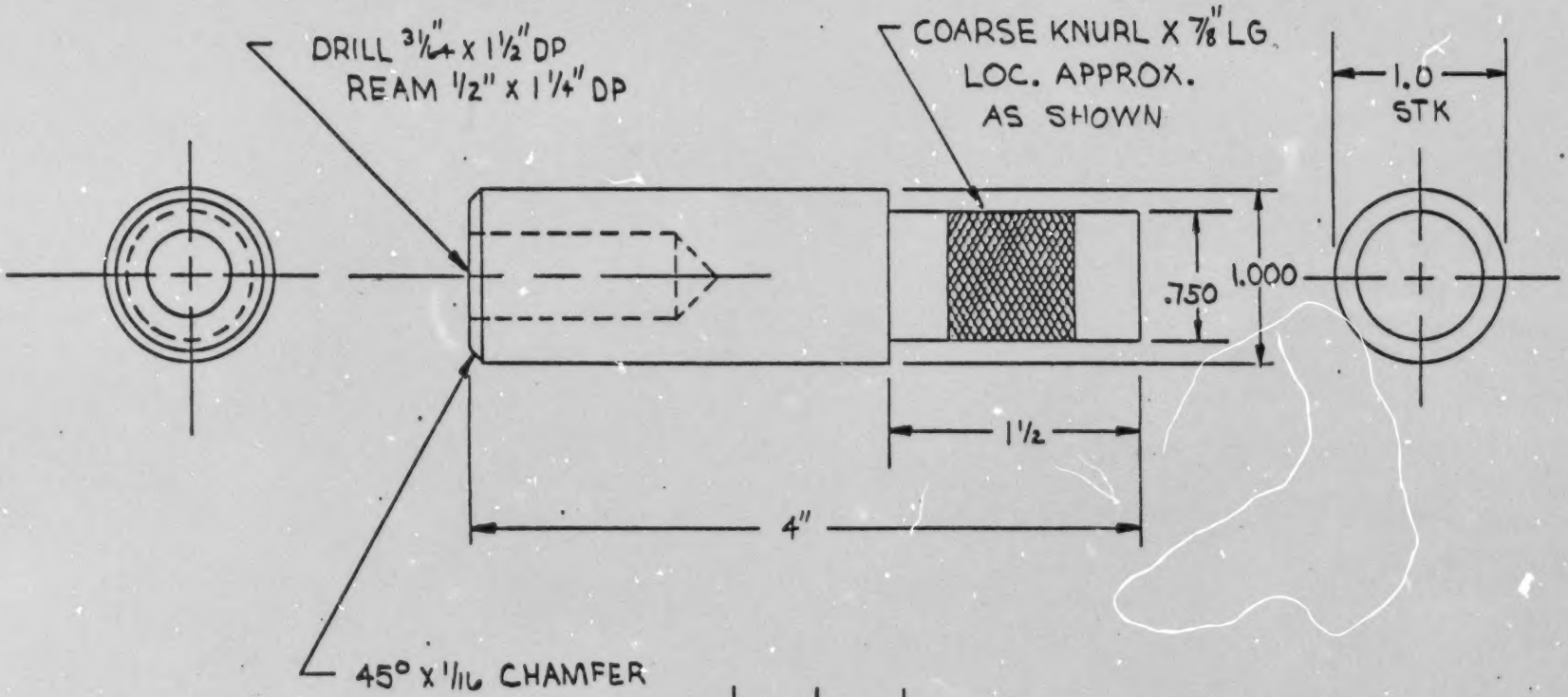
First Operation

Step:
1. Align lathe centers.
2. Load 3-jaw chuck on spindle.
3. Load 4-inch piece of 1-inch round bar stock; load 3/4 inch.
4. Load left-hand turning tool in tool holder and center.
5. Face stock to clean up.
6. Load #2 center drill in drill chuck and center drill to start drilling.
7. Load 31/64-inch drill in drill chuck and drill 1½ inches deep.
8. Load ½ inch reamer in drill chuck and ream 1¼ inches deep.
9. Load 45-degree chamfer tool in tool holder and form 45 degree by 1/16 inch long chamfer.
10. Break all sharp edges.

Second Operation

Step
1. Load on finished end in 3-jawed chuck, out 2½ inches.
2. Load left-hand turning tool in tool holder on center and face to length.
3. Load right-hand turning tool in tool holder; rough and finish turn .750" diameter by 1½ inches long.
4. Make a coarse knurl 3/4 inch long on a .750 diameter as per print.
5. Break all sharp edges.

BEST COPY AVAILABLE



NOTE:

1. BREAK ALL SHARP EDGES

ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED FRACTIONAL ± 1/64 DECIMAL .X ± .1 .XX ± .03 .XXX ± .010 ANGULAR ± 1° SURFACE ✓63		INDIAN HILLS COMM. COLL.
		MATERIAL: MILD. STL. 1.0 D x 4 1/8 LG SCALE FULL DRAWN BY APPROVED BY
		TITLE: KNURLED PLUG - LATHE
		DATE 10/5/82 DRAWING NUMBER 604.685-026 SHT. 3 OF 4 CHG. LTR.

LATHE

SAFETY INSTRUCTIONS

1. Use caution when turning long, narrow bar material which extends beyond the end of the lathe. Support it in a manner that will prevent the material from whipping, and tie a piece of cloth to the end of the stock to warn other students.

2. Exercise care while setting up work between centers on a lathe. Make certain that the tail stock is securely clamped before turning on the lathe to prevent the work from flying out.

3. Use chuck blocks or some other form of support while mounting the chuck or removing it from the spindle, so as to keep the chuck from dropping on the fingers or feet.

4. When the lathe is in operation, do not touch the work with the hands, wipe it with a rag, encircle it with a piece of emery cloth, or measure it with a micrometer. These are all dangerous practices.

5. Keep the gear cover closed while operating the lathe to prevent hands or clothes from being caught in the moving parts.

6. Turn the chuck or face plate one complete circle before turning on the power to determine if there is proper clearance of the lathe bed.

7. Remove the cutting tool from the tool holder and move the compound rest toward the tail stock before filing and polishing to prevent injury to hands and arms.

8. Remove the chuck key or wrench immediately after using it to prevent its flying out when the machine is started.

9, Stop the power feed before tool reaches the jaws of the chuck. This procedure will prevent the tool bit from digging into the work and causing breakage or flying particles.

10. Do not handle the curling chips of metal while the lathe is in motion. The jagged edges of the metal chips may lacerate the fingers, or they may catch the hand and draw it into the work. Use a brush to remove small chips and use a small bar for long, curled chips.

LEVEL II

LATHE

COMPETENCY NO. 2.

1. Objective

To develop basic skills in facing cuts, center drilling, drilling, reaming and coring with the engine lathes. To instill safe practices while performing these operations.

2. Equipment

Engine lathe

3. Material

2 1/16 inch piece of 1-inch round steel bar stock

4. Tools required

A. 6" vernier caliper
B. 6" machinist scale
C. No. 2 center drill
D. 31/64" drill
E. ½" reamer
F. ½" drill chuck and key
G. Left-hand turning tool
H. Boring tool
I. Flat mill file

5. Reference

Operational sequence sheet
Blueprint sheet
Safety sheet

6. Information

Student may request instruction for a first piece part.

7. Safety

All previous safety instructions pertain to the operation of the engine lathe.

LEVEL II

LATHE

COMPETENCY NO. 2

TASK:

To produce a drilled and bored shaft.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up the engine lathe and machine part to print specifications.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load tools in holders and center for cutting.
3. Load work in holding device
4. Perform all operations to print specifications in a safe manner.
5. Clean machine and work area. Return all tooling to proper storage area.

LEVEL II

ENGINE LATHE

COMPETENCY NO. 2

OPERATIONAL SEQUENCE SHEET

First Operation

Step 1. Load 2 1/16 inch piece of 2 inch round bar stock in 3-jawed chuck. Load out ½ inch.

2. Load left hand turning tool in tool holder and face off to clean up. R.p.m. Feed.

3. Center drill #2 r.p.m.

4. Drill 31/64 hold through r.p.m. Feed.

5. Ream .500 diameter through r.p.m. Feed.

6. Bore .625 diameter x .250 deep r.p.m. Feed.

7. Break all sharp edges.

Second Operation

Step 1. Load in 3-jawed chuck out ½ inch.

2. Face to print r.p.m. Feed.

LEVEL II

TASK OPERATIONAL SHEET

LATHE

1. Objective

To develop basic skill in long and short taper turning using both compound rest and taper turning attachment.

2. Equipment

Engine Lathe

3. Material required

6" piece of 1" round bar stock

4. Tools required

A. 6" machinist scale
B. Right hand turning tool
C. Flat mill file

5. Reference

Operational sequence sheet
Blueprint sheet
Safety sheet

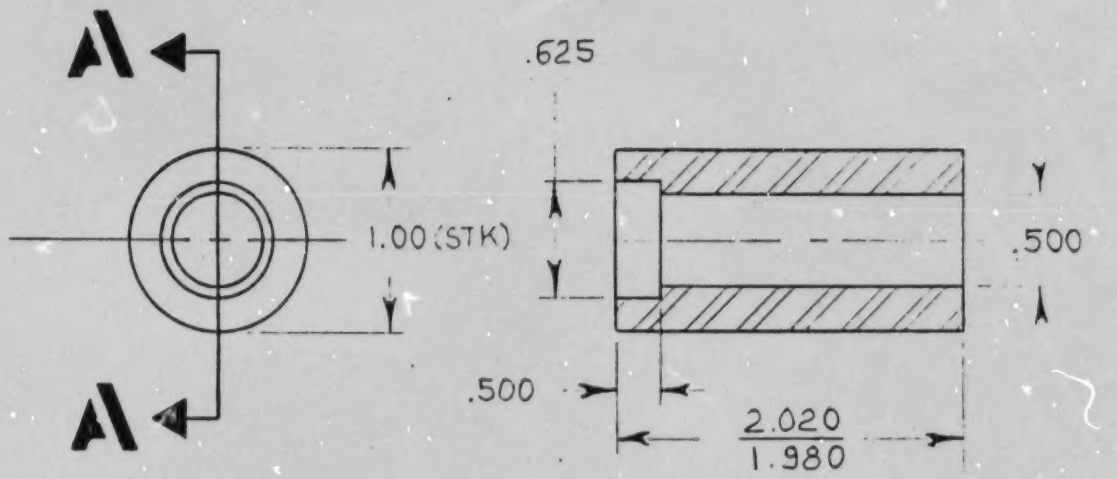
6. Information

Student may request verbal instructions. All tools will be furnished.

NOTES:

1. DEBURR ALL SHARP EDGES MIN .005

BEST COPY AVAILABLE



SEC A-A

ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED		INDIAN HILLS COMM. COLL.
FRACTIONAL 1/64		
DECIMAL .X ± .1 .XX ± .02 .XXX ± .005		C.R.S. SCALE FULL DRAWN BY APPROVED BY
ANGULAR ± 5°		TITLE RECESSED BEARING
SURFACE 125		DATE DRAWING NUMBER 604.685-026 CHG. LTR.

LATHE

SAFETY INSTRUCTIONS

1. Use caution when turning long, narrow bar material which extends beyond the end of the lathe. Support it in a manner that will prevent the material from whipping, and tie a piece of cloth to the end of the stock to warn other students.

2. Exercise care while setting up work between centers on a lathe. Make certain that the tail stock is securely clamped before turning on the lathe to prevent the work from flying out.

3. Use chuck blocks or some other form of support while mounting the chuck or removing it from the spindle, so as to keep the chuck from dropping on the fingers or feet.

4. When the lathe is in operation, do not touch the work with the hands, wipe it with a rag, encircle it with a piece of emery cloth, or measure it with a micrometer. These are all dangerous practices.

5. Keep the gear cover closed while operating the lathe to prevent hands or clothes from being caught in the moving parts.

6. Turn the chuck or face plate one complete circle before turning on the power to determine if there is proper clearance of the lathe bed.

7. Remove the cutting tool from the tool holder and move the compound rest toward the tail stock before filing and polishing to prevent injury to hands and arms.

8. Remove the chuck key or wrench immediately after using it to prevent its flying out when the machine is started.

9, Stop the power feed before tool reaches the jaws of the chuck. This procedure will prevent the tool bit from digging into the work and causing breakage or flying particles.

10. Do not handle the curling chips of metal while the lathe is in motion. The jagged edges of the metal chips may lacerate the fingers, or they may catch the hand and draw it into the work. Use a brush to remove small chips and use a small bar for long, curled chips.

LEVEL III

TASK OPERATION SHEET

LATHE

1. Objective

To develop basic skill in long and short taper turning using both compound rest and taper turning attachment.

2. Equipment

Engine Lathe

3. Material required

6" piece of 1" round bar stock

4. Tools required

A. 6" machinist scale
B. Right hand turning tool
C. Flat mill file

5. Reference

Operational sequence sheet
Blueprint sheet
Safety sheet

6. Information

Student may request verbal instructions. All tools will be furnished.

ENGINE LATHE

COMPETENCY NO. 3

TASK:

To produce a tapered self-centering pin.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up lathe and machine a part to prescribed dimensions.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load part in 3-jaw chuck and set compound and taper attachment for prescribed angles.
3. Perform all machining operations to print dimensions.
4. Clean work area and machine, returning all tools to proper storage area.

BEST COPY AVAILABLE

ENGINE LATHE

COMPETENCY NO. 3

OPERATIONAL SEQUENCE SHEET

First Operation

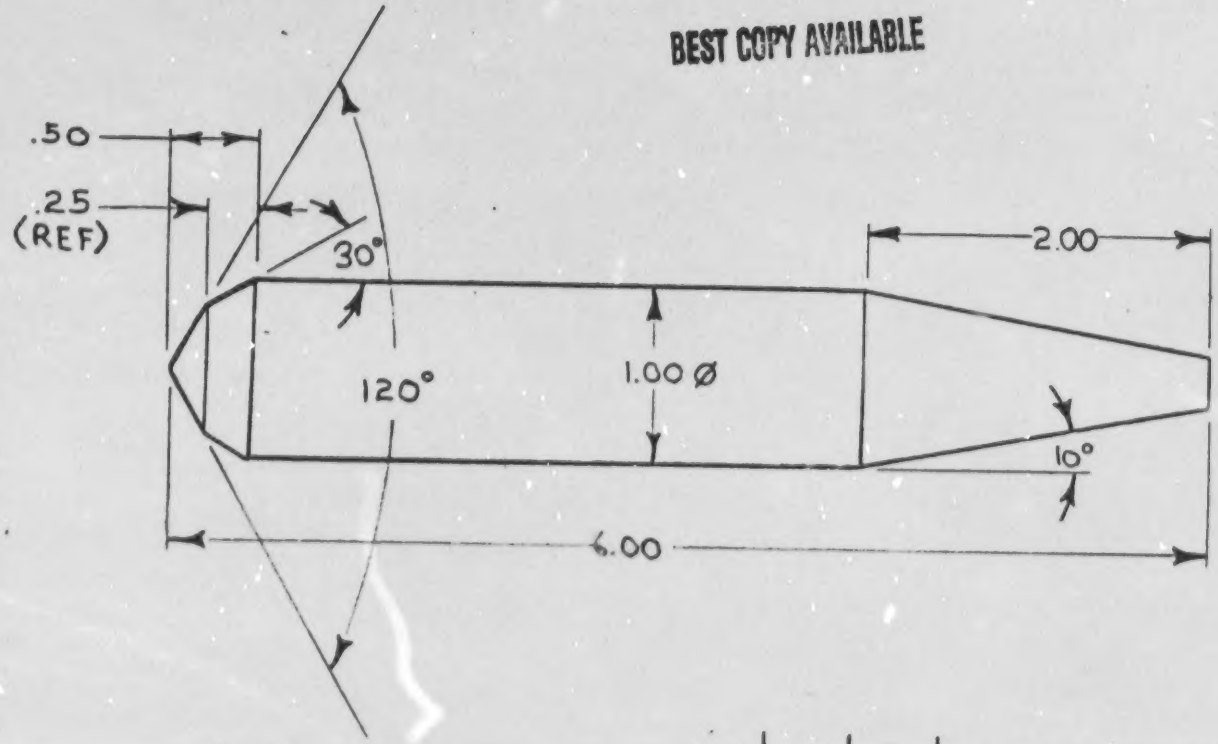
Step
1. Load 6-inch piece of 1-inch round bar stock in 3-jaw chuck. Load out 2 inches.
2. Load right-hand turning tool in holder.
3. Swing compound in line with cross slide, then count off 30 degrees clockwise and secure compound lock nuts.
4. Turn angle to a point which will be 120 degrees included angle with the compound.
5. Loosen compound, swing it 90 degrees to cross-slide, then cut 60 degree included angle ½ inch wide with compound.
6. Break all sharp edges.

Second Operation

Step
1. Load part in 3-jaw chuck, out 3 inches.
2. Set tape attachment swivel bar to center position of cross slide.
3. Position cross slide with right-hand turning tool in position and move carriage so tool point will be at approximately center position of taper to be cut.
4. Lock taper attachment to the machine by locking clamp to bed.
5. Cut 16 degree included angle 2 inches long.
6. Break all sharp edges.

BEST COPY AVAILABLE

BEST COPY AVAILABLE



NOTE: BREAK ALL SHARP EDGES

ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED FRACTIONAL ± ~ DECIMAL .XX ± ~ .XX ± .02 .XXX ± ~ ANGULAR ±0° 30' SURFACE 32 ✓		INDIAN HILLS COMM. COLL. MATERIAL: COLD-ROLLED STEEL SCALE FULL DRAWN BY APPROVED BY MOORE TITLE TAPERED SELF-CENTERING PIN DATE DRAWING NUMBER CHG. LTR.

-35-

LATHE

SAFETY INSTRUCTIONS

1. Use caution when turning long, narrow bar material which extends beyond the end of the lathe. Support it in a manner that will prevent the material from whipping, and tie a piece of cloth to the end of the stock to warn other students.

2. Exercise care while setting up work between centers on a lathe. Make certain that the tail stock is securely clamped before turning on the lathe to prevent the work from flying out.

3. Use chuck blocks or some other form of support while mounting the chuck or removing it from the spindle, so as to keep the chuck from dropping on the fingers or feet.

4. When the lathe is in operation, do not touch the work with the hands, wi it with a rag, encircle it with a piece of emery cloth, or measure it wi a micrometer. These are all dangerous practices.

5. Keep the gear cover closed while operating the lathe to prevent hands o clothes from being caught in the moving parts.

6. Turn the chuck or face plate one complete circle before turning on the power to determine if there is proper clearance of the lathe bed.

7. Remove the cutting tool from the tool holder and move the compound rest toward the tail stock before filing and polishing to prevent injury to hands and arms.

8. Remove the chuck key or wrench immediately after using it to prevent its flying out when the machine is started.

9, Stop the power feed before tool reaches the jaws of the chuck. This procedure will prevent the tool bit from digging into the work and causing breakage or flying particles.

10. Do not handle the curling chips of metal while the lathe is in motion. The jagged edges of the metal chips may lacerate the fingers, or they may catch the hand and draw it into the work. Use a brush to remove small chips and use a small bar for long, curled chips.

BEST COPY AVAILABLE

LEVEL IV

ENGINE LATHE

COMPETENCY NO. 4

TASK OPERATION SHEET

1. Objective

To develop basic skills in single point threading and an understanding of thread terminology.

2. Equipment:

Engine lathe

3. Tools Required:

Thread pitch micrometer
0 - 1 inch O.D. micrometer
Thread relief tool kit
45 - degree chamfer tool
60 - degree threading tool
Right-hand turning tool
Flat mill file

4. Material Required:

3" piece of 1" round steel bar stock

5. Reference:

Operational sequence sheet
Blueprint sheet
Safety sheet

6. Information:

Student may request verbal instruction. All tools will be furnished.

Student may request some practice time as this operation is one of the most difficult tasks performed on the engine lathe.

BEST COPY AVAILABLE

LEVEL IV

ENGINE LATHE

COMPETENCY NO. 4

TASK:

To produce a threaded arbor.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up and operate the engine lathe and perform all necessary operations to print dimensions.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Verbally identify and describe the use of given tools and equipment.
2. Load part in proper holding devise and set tools for machining part.
3. With part loaded in proper holder, perform all machining operations to print dimensions.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Verbally identify and describe the use of given tools and equipment.
2. Load part in proper holding devise and set tools for machining part.
3. With part loaded in proper holder perform all machining operations in a safe and prescribed manner.
4. Clear work area and machine returning all tools to storage area.

BEST COPY AVAILABLE

LEVEL IV

ENGINE LATHE

COMPETENCY NO. 4

OPERATIONAL SEQUENCE SHEET

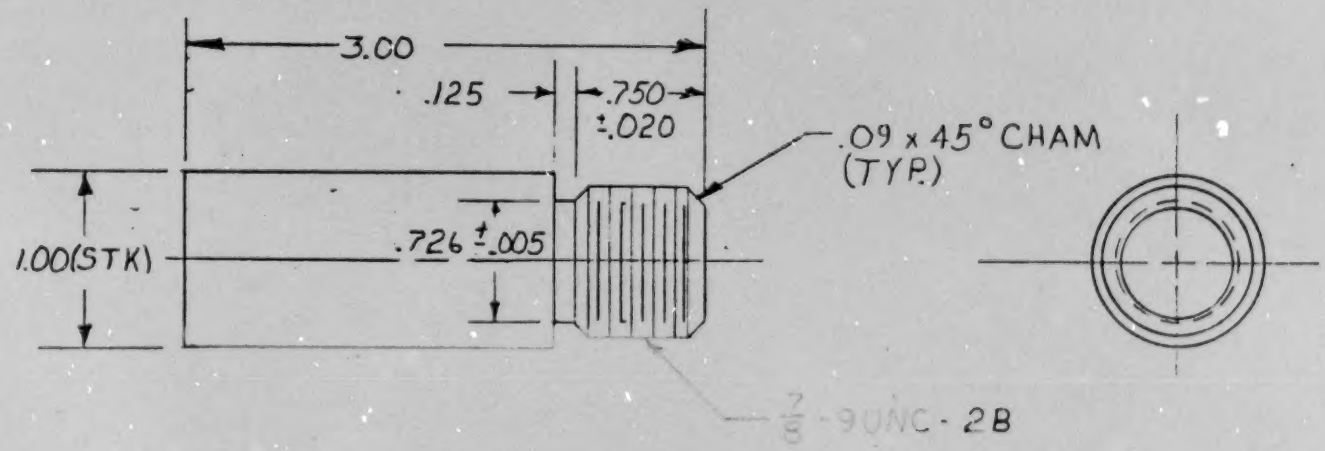
First Operation

Step

1. Load 3" long by 1" round stock in 3-jaw chuck, out 1½".
2. Face to clean.
3. Load right-hand tool in holder.
4. Turn outside diameter to .875" + .0000, -.005" by 3/4" long ± .030".
5. Load thread relief tool and cut thread relief to print.
6. Load 45-degree chamfer tool and form 45 degree chamfer on equal of part 45 degrees x 3/16".
7. Set compound in line with cross slide and swing counter clockwise, counting off 29 degrees. Lock compound in this position.
8. Load threading tool in holder 90 degrees to work. Move slide in until tool tip scratches work. Set cross slide Dial at zero. Set depth of cut with compound until depth of thread is reached. To determine depth of thread, rule of thumb is figured by dividing the number of threads per inch by .750.
9. Set gear box for number of thread per inch to be cut.
10. Set machine at a low r.p.m.
11. Break all sharp edges.
12. Inspect for proper fit.

BEST COPY AVAILABLE

NOTE:
1. DEBURR ALL SHARP EDGES



ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED		INDIAN HILLS COMM. COLL.
FRACTIONAL ±		CRS / SCALE FULL / DRAWN BY / APPROVED BY
DECIMAL .X ± .1 .XX ± .06 .XXX ± .010		TITLE: STUD-THREADED
ANGULAR ±		DATE / DRAWING NUMBER / CHG. LTR.
SURFACE 125 ✓		

BEST COPY AVAILABLE

LEVEL I

COMPETENCIES IN OPERATION OF

MILLING MACHINES

Safety

Before beginning the demonstration of competencies in using a milling machine, the student shall:

I. Review the general safety instructions for Machine Trades.

II. Review the specific safety instructions for milling machine operation, which are listed below.

MILLING MACHINE SAFETY INSTRUCTIONS

1. Before starting the power, fasten all clamps and attachments securely to prevent the work from flying off the table.

2. Before starting the power, disengage all clutches and feeds to prevent the cutter from starting unexpectedly.

3. Adjust the arbor nut only when the over arm support has been detached. Do not attempt to use the machine power as it will spring the arbor and throw the wrench.

4. Do not let oil or cutting compound accumulate on the floor. Spread sawdust and sweep immediately to prevent slips and falls.

5. Stop the cutter before taking any measurements of the work. Tools or clothing may be caught and drag you into the cutter.

6. Keep hands at least 8 inches away from revolving cutters at all times. Do not point fingers at them or try to clean out chips when cutters are running.

BEST COPY AVAILABLE

LEVEL I

HORIZONTAL MILLIHG MACHINE

TASK OPERATION SHEET

1. Objective:

   To develop basic skills in the operation of the horizontal milling machine and its safe operation.

2. Equipment Required:

   Plain horizontal milling machine.

3. Material Required:

   1 inch diameter by 2¼ inches long round steel bar stock.

4. Tools Required:

   6 inch machinist scale
   0 to 1 inch micrometer

5. Reference:

   Operational sequence sheet
   Print sheet
   Safety sheet

6. Information:

   Student may request a demonstration from instructor or "buddy" student for a first piece part. All tooling will be furnished. The part that is given to instructor for grade will be final. If a request is made for remake, 5 points will be deducted from grade.

7. Safety;

   Student will receiv detailed safety instructions for the horizontal milling machine.

BEST COPY AVAILABLE

MILLING MACHINE

COMPETENCY NO. 1

TASK:

To produce a milled plug.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up a horizontal mill and mill the sides of plug to print specifications.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load holding device and part on mill table.
3. Load proper cutter on arbor.
4. Load part in mill vise and perform all operations to print specifications in a safe manner.
5. Clean machine and work area. Return all tools to storage.

BEST COPY AVAILABLE

LEVEL I

HORIZONTAL MILLING MACHINE

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 1

First Operation:

Step 1. Load correct size mill arbor in mill spindle.

2. Load 5 inch by 3/4 inch stagger tooth mill cutter about center way of arbor.

3. Load arbor support on over arms and arbor and tighten.

4. Load mill vise on table, indicate and fasten to mill table.

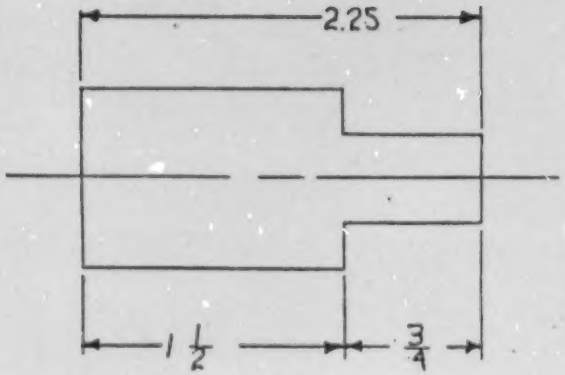
5. Load part in mill vise on parallel bar above surface of vise and mill 3/4 inch wide by ¼ inch deep step on one end of bar.

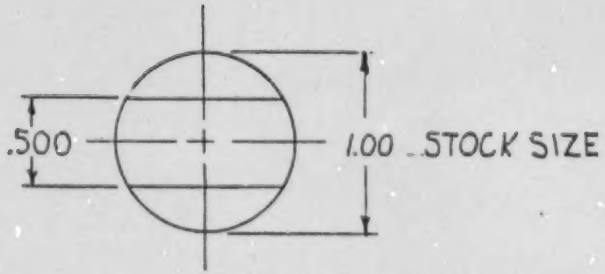
Second Operation:

Step 1. Load part in vise with step side down, indicate step for flatness, close vise and repeat step #5 in First Operation, holding .500 flat as per print.

2. Remove part from vise and deburr all sharp edges. Inspect for print dimensions.

BEST COPY AVAILABLE





NOTES:

1. BREAK ALL SHARP EDGES.

BEST COPY AVAILABLE

ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED FRACTIONAL ± 1/32 DECIMAL .X ± .___ .XX ± .___ .XXX ± .010 ANGULAR ± SURFACE 125		INDIAN HILLS COMM. COLL. MATERIAL: MILD STEEL 1.00 DIA X 2.25 SCALE: FULL DRAWN BY APPROVED BY TITLE: PLUG - MILL DATE DRAWING NUMBER: 605 685-030, PG. 4 OF 4. CHG. LTR.

LEVEL II

MILLING MACHINE

SAFETY INSTRUCTION

1. Before starting the power, fasten all clamps and attachments securely to prevent the work from flying off the table.

2. Before starting the power, disengage all clutches and feeds to prevent the cutter from starting unexpectedly.

3. Adjust the arbor nut only when the over arm support has been detached. Do not attempt to use the machine power as it will spring the arbor and throw the wrench.

4. Do not let oil or cutting compound accumulate on the floor. Spread Spread sawdust and seep immediately to prevent slips and falls.

5. Stop the cutter before taking any measurements of the work. Tools or clothing may be caught and drag you into the cutter.

6. Keep hands at least 8 inches away from revolving cutters at all times. Do not point fingers at them or try to clean out chips when cutters are running.

BEST COPY AVAILABLE

LEVEL II

HORIZONTAL MILLING MACHINE

TASK OPERATION SHEET

COMPETENCY NO. 2

1. Objective:

   To develop more in-depth skills in the operation of the horizontal milling machine.

2. Equipment Required:

   Plain horizontal milling machine.

3. Material Required:

   3 1/8" long by 1" diameter round steel bar stock.

4. Tools required:

   6" machinist scale
   Depth micrometer
   10" flat file

5. Reference:

   Operational sequence sheet
   Blueprint sheet
   Safety sheet

6. Information:

   Student may request instructions.
   All tools will be furnished.

7. Safety:

   All previous safety instructions on the milling machine will apply for this operation.

BEST COPY AVAILABLE

LEVEL II

MILLING MACHINE

COMPETENCY NO. 2

TASK:

To produce a keyed shaft.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up and will part to print specifications.

CRITERIA OF ACCEPTABLE PERFORMANCE:

1. Identify and describe the use of given tools and equipment.
2. Properly load holding device and part on mill table.
3. Load proper cutter on arbor.
4. Load part in mill vise and perform all operations to print specifications in a safe manner.
5. Clean work area and machine. Return all tooling to storage area.

BEST COPY AVAILABLE

LEVEL II

HORIZONTAL MILLING MACHINE

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 2

First Operation:

Step

1. Load 1/4" wide stagger tooth cutter of an available diameter on arbor as close to column as part will permit.
2. Load mill vise on table and indicate solid jaw parallel to table.
3. Load 3" length of 1" round steel bar stock flat on parallel bar, 1" out.
4. Slightly scratch side of part with rotating cutter. Clear part and move saddle over .625". Move knee up for depth of cut until keyway measures .125 deep. Cut full length of stock. Feed .003 chip load per tooth. 150 r.p.m. 5" cutter.

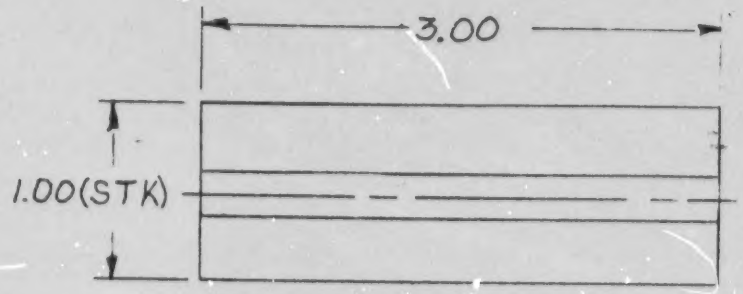
Second Operation:

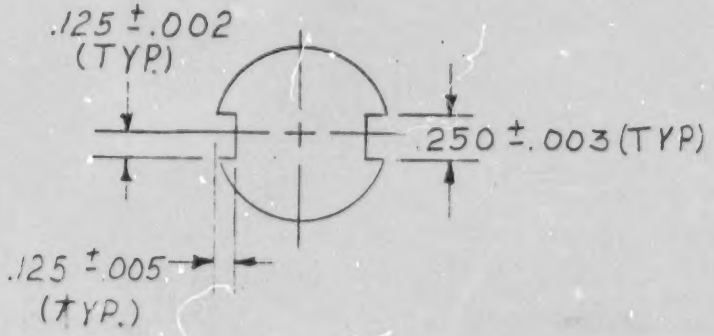
Step

1. Turn bar stock over 180 degree and cut same keyway on other side.

BEST COPY AVAILABLE

NOTE:
1. DEBURR ALL SHARP EDGES





ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED FRACTIONAL ± DECIMAL .X ± .1 .XX ± .02 XXX ± .NOTE ANGULAR ± SURFACE ✓		INDIAN HILLS COMM. COLL. CRS / SCALE FULL / DRAWN BY / APPROVED BY TITLE: DOUBLE KEY SHAFT DATE / DRAWING NUMBER / CHG. LTR.

BEST COPY AVAILABLE

LEVEL III

MILLING MACHINE

SAFETY INSTRUCTION

1. Before starting the power, fasten all clamps and attachments securely to prevent the work from flying off the table.

2. Before starting the power, disengage all clutches and feeds to prevent the cutter from starting unexpectedly.

3. Adjust the arbor nut only when the over arm support has been detached. Do not attempt to use the machine power as it will spring the arbor and throw the wrench.

4. Do not let oil or cutting compound accumulate on the floor. Spread Spread sawdust and seep immediately to prevent slips and falls.

5. Stop the cutter before taking any measurements of the work. Tools or clothing may be caught and drag you into the cutter.

6. Keep hands at least 8 inches away from revolving cutters at all times. Do not point fingers at them or try to clean out chips when cutters are running.

BEST COPY AVAILABLE

LEVEL III

HORIZONTAL MILLING MACHINE

TASK OPERATION SHEET

COMPETENCY NO. 3

1. Objective:

   To develop skills in horizontal mill machining and the use of its attachments.

2. Equipment

   Horizontal milling machine and index head.

3. Material Required:

   One-inch round steel bar 3" long.

4. Tools required:

   A. 6" machinist scale
   B. 0 to 1 micrometer
   C. 10" flat file

5. Reference:

   Operational sequence sheet
   Blueprint sheet
   Safety sheet

6. Information:

   Student may request instructions. All tools will be furnished.

7. Safety:

   All previous safety instructions on the milling machine will apply for this operation.

BEST COPY AVAILABLE

LEVEL III

MILLING MACHINE

COMPETENCY NO. 3

TASK:

To produce a hexagonal end on round stock.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up a horizontal mill and perform all milling operations to print specifications.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load tooling, holding device, and part on mill table.
3. Perform all mill operations to specifications in a safe and prescribed manner.
4. Clean machine and work area, returning all tooling to storage area.

BEST COPY AVAILABLE

LEVEL III

HORIZONTAL MILLING MACHINE

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 3

First Operation:

Step 1. Saw 1-inch diameter round bar stock by 3 1/8 inches long.

Second Operation:

Step 1. Load in aligned mill vise on and square to clean up one end.

Third Operation:

Step 1. Load in mill vise with finished end down and mill, holding 2¼ inch length.

2. Deburr both ends.

Fourth Operation:

Step 1. Load index head and align to table.

Step 2. Load stub arbor in mill and install 4-flute end mill.

Step 3. Load 1-inch round bar stock in 3-jawed chuck on index head; load out 1½ inches.

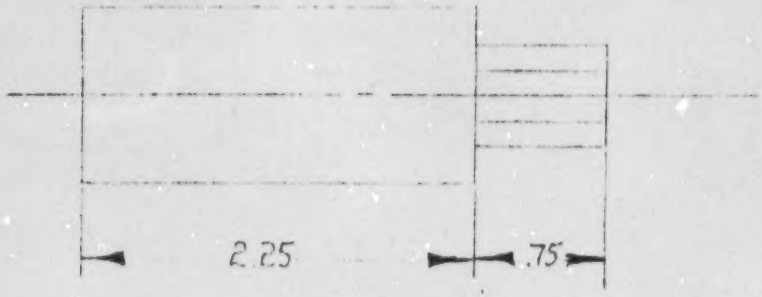
Step 4. Load correct index plate on index head to cut 6 equal sides.

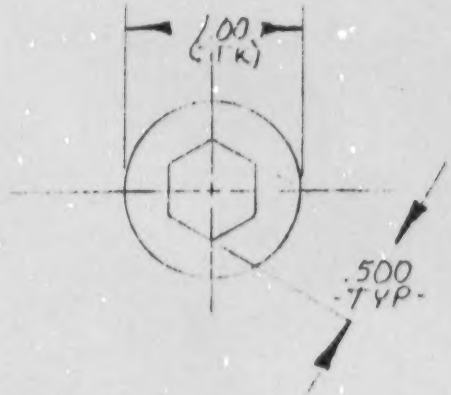
Step 5. Mill 6 sides and hold ½" x 3/4" long.

Step 6. Break all sharp edges.

BEST COPY AVAILABLE

BEST COPY AVAILABLE





ITEM NO.	QTY.	DESCRIPTION

TOLERANCES NOT SPECIFIED
FRACTIONAL ±
DECIMAL .X ± .2 .XX ± .02 .XXX ± .005
ANGULAR ±
SURFACE √125

INDIAN HILLS COMM. COLL.

MATERIAL: COLD ROLLED STEEL | SCALE FULL | DRAWN BY | APPROVED BY

TITLE: BLOCK - HEX END 66

DATE | DRAWING NUMBER | CHG LTR

NOTE - BREAK ALL SHARP EDGES

65

LEVEL IV

MILLING MACHINE

SAFETY INSTRUCTION

1. Before starting the power, fasten all clamps and attachments securely to prevent the work from flying off the table.

2. Before starting the power, disengage all clutches and feeds to prevent the cutter from starting unexpectedly.

3. Adjust the arbor nut only when the over arm support has been detached. Do not attempt to use the machine power as it will spring the arbor and throw the wrench.

4. Do not let oil or cutting compound accumulate on the floor. Spread Spread sawdust and seep immediately to prevent slips and falls.

5. Stop the cutter before taking any measurements of the work. Tools or clothing may be caught and drag you into the cutter.

6. Keep hands at least 8 inches away from revolving cutters at all times. Do not point fingers at them or try to clean out chips when cutters are running.

BEST COPY AVAILABLE

LEVEL IV

HORIZONTAL MILLING MACHINE

TASK OPERATION SHEET

COMPETENCY NO. 4

1. Objective:

   To develop a more complex skill in the operation of the plain horizontal milling machine.

2. Equipment:

   Horizontal milling machine

3. Material required:

   1 5/8" by 1 5/8" by 2 1/8" bar stock of oil hardening steel.

4. Tools required:

   6" machinist scale
   1" to 2" micrometer O.D.
   3" to 4" micrometer O.D.
   Combination square
   Steel scribe and layout blue
   Vernier protractor
   Depth micrometer
   Clean shop towel
   Precision square

5. Reference:

   Operational sequence sheet
   Blueprint sheet
   Safety sheet

6. Information:

   Student may request instruction. All tooling will be furnished.

7. Safety:

   All previous safety instructions on the milling machine will apply for this operation.

BEST COPY AVAILABLE

LEVEL IV

MILLING MACHINE

COMPETENCY NO. 4

Task:

To produce a VEE block.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up and mill to blueprint dimensions all mill operations.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load holding device on mill table.
3. Load proper cutter on arbor.
4. Load part in mill vise and perform all milling operations to the prescribed dimensions in a safe manner.
5. Clean machine and work area, returning all tools to storage.

BEST COPY AVAILABLE

LEVEL IV

HORIZONTAL MILLING MACHINE

ENABLING TASKS FOR

COMPETENCY NO. 4

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 1" to 2" O.D. micrometer

Identify and read 3" to 4" O.D. micrometer

Identify and use combination square

Identify and use steel scriber

Identify and use layout blue

Identify and read vernier protractor

Identify and read depth micrometer

Identify and use precision square

Demonstrate how to and load mill vise parallel to table

Identify and 6" stagger tooth cutter

Identify and use 1/8" wide slotting mill cutter

Identify and use 90° (45° on a side) mill file

Identify and use flat mill file

BEST COPY AVAILABLE

LEVEL IV

HORIZONTAL MILLING MACHINE

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 4

First Operation:

Step 1. Saw a piece of 1 5/8" x 1 5/8" rectangular bar stock 2" long.

Second Operation:

Step 1. Load mill vise on mill table and indicate solid jaw parallel to machine saddle.

2. Load part in vise hold on flat slides, out ½" parallel to table and, using 6" stagger tooth cutter, face end of part to clean up. R.p.m. 180 - Feed .500 p.m.

Third Operation:

Step 1. Turn part with other end out ½" and mill end, holding 2.030" overall length. Speed and feed as Operation #10.

Fourth Operation:

Step 1. Load part in mill vise on parallel bars ½" above vise surface, holding on ends of part.

2. Using slab mill cutter, mill top side, holding 1.530" dimension. R.p.m. _____ Feed _____.

Fifth Operation

Step 1. Rotate part 1 turn in vise and repeat Operation #15, holding 1.530" dimension. Same speed and feed as Operation #20.

Sixth Operation:

Step 1. Holding part on ends in mill vise 5/8" above vise surface on parallel bars, indicate for flatness.

2. Using 1/8" wide slotting mill cutter, mill slot .515" deep in center part for full length as per sketch.
R.p.m. _____ Feed _____.

Seventh Operation:

Step 1. Load part in mill vise bottom side up and repeat Operation #30. Speed and feed same as Operation #30.

BEST COPY AVAILABLE

LEVEL IV

HORIZONTAL MILLING MACHINE

OPERATIONAL SEQUENCE SHEET (CONT'D)

COMPETENCY NO. 4

Eighth Operation:

Step 1. Load part in mill vise with one of unslotted sides up on parallel bars. Indicate for flatness.

2. Mill 1/8" slot in center of post by .390" deep, full length of post as per sketch. Speed and feed same as Operation #30.

Ninth Operation:

Step 1. Turn part over and repeat Operation #40.

Tenth Operation:

Step 1. Load in mill vise on parallel bars 5/8" above surface of vise. Indicate for flatness.

2. Load 90 degrees (45 degrees each side) mill cutter and cut 90 degree groove as per sketch, leaving .015" per surface for grind stock, holding .375" dimension to .390".
R.p.m. _____ Feed _____.

Eleventh Operation:

Step 1. Turn part over (½ turn) and repeat Operation #50.

Twelfth Operation:

Step 1. Load part in mill vise same as Operation #50 with unfinished side up. Mill 90 degree groove as per sketch, holding .250" dimension to .265" for grinding.

Thirteenth Operation:

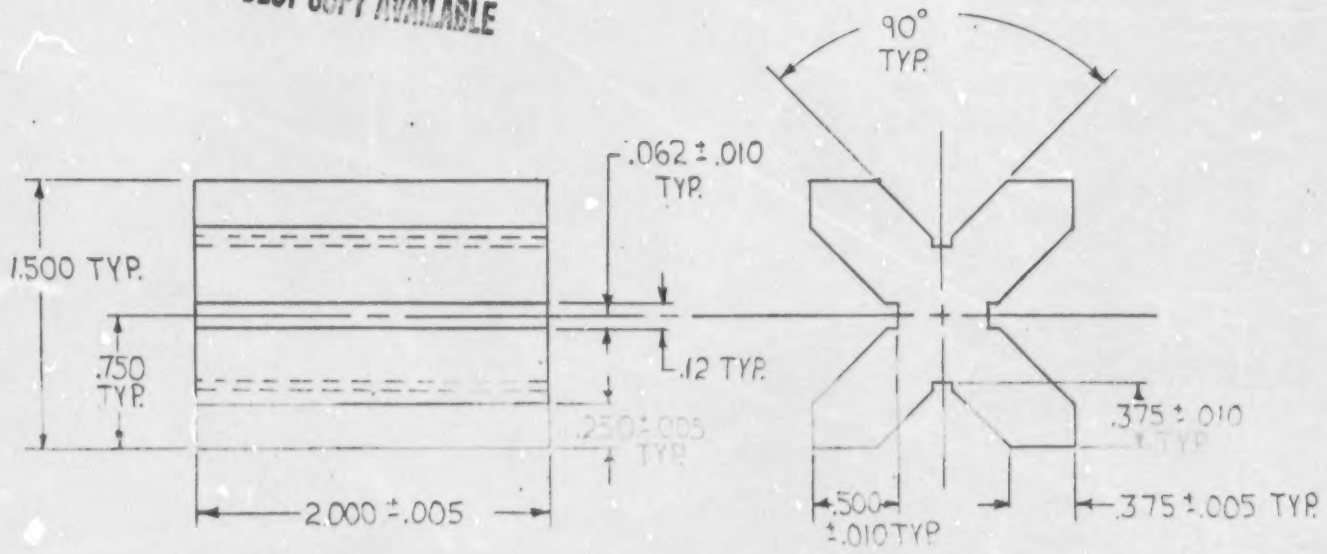
Step 1. Load part in mill vise with unfinished side up and repeat Operation #60.

Fourteenth Operation:

Step 1. Deburr, inspect and stock for grinding.

BEST COPY AVAILABLE

BEST COPY AVAILABLE



NOTES:

1. BREAK ALL SHARP EDGES
2. HEAT TREAT: 1450 DEGREES - OIL QUENCH
3. TEMPER: 450 DEGREES - OIL QUENCH

ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED FRACTIONAL ± DECIMAL X ± .1 XX ± .02 XXX ± .005 ANGULAR ± 0° 30' SURFACE ✓ 32		INDIAN HILLS COMM. COLL. SCALE FULL DRAWN BY APPROVED BY TITLE VEE-BLOCK DATE DRAWING NUMBER CHG. LTR.

LEVEL I

COMPETENCIES IN OPERATION OF DRILL PRESSES

Safety

Before beginning the demonstration of competencies in using a drill press, the student shall:

I. Review the general safety instructions for Machine Trades.

II. Review the specific safety instructions for drill press operation, which are listed below:

DRILL PRESS SAFETY INSTRUCTIONS

1. Use the drill press vise or clamp to hold the work being drilled. This is to prevent the drill from catching into and throwing the work.

2. Grip the vise firmly or clamp the vise to the table, while drilling, to prevent the drill from breaking on the work and vise from revolving dangerously.

3. Lessen the feed pressure as the drill cuts through the work. This will decrease the danger of the drill catching the work and causing it to revolve.

4. Stop the machine immediately if the drill catches in a piece of work, causing it to revolve, and do not touch the work while it is in the machine.

5. Always use a sharp drill which has been ground appropriately for the material to be cut. Drills which have been improperly ground may dig into the work and throw it.

6. Operate the drill at the correct speed for the size of the drill and the kind of material. If too much speed is used, or if the drill is forced too rapidly into the material, the drill may break.

7. Remove the chuck key from the chuck and the drift from the spindle before turning on the power to prevent them from flying.

8. Stop the machine before removing work, chips, or cuttings. Avoid injury by using a brush to remove chips.

9. Be sure that the drill is securely fastened and is centered in the chuck before turning on the power.

10. Keep face away from the work being drilled to prevent injury to eyes or face in case the drill breaks or hot oil and chips fly out.

BEST COPY AVAILABLE

LEVEL I

DRILL PRESS

TASK OPERATION SHEET

COMPETENCY NO. 1

1. Objective:

   To develop basic skills in the operation of the drill pre .

2. Equipment:

   Single-spindle drill press.

3. Material:

   4" long by 1" wide by ½" thick plate of steel.

4. Tools required:

A.	6" machinist scale	E.	Center drill
B.	12" combination square	F.	½" drill
C.	Center punch	G.	Ball peen hammer
D.	Center punch	H.	½" Jacobs chuck

5. Reference:

   Operational sequence sheet
   Print sheet
   Safety sheet

6. Information:

   The student may request a demonstration from instructor or "bu student for a first piece part. All tooling will be furnished. that is turned in to instructor for grade will be final. If a made for a remake 5 points will be deducted from grade.

7. Safety:

   All students will receive detailed safety instructions cov presses.

BEST COPY AVAILABLE

LEVEL I

DRILL PRESS

COMPETENCY NO. 1

TASK:

To saw a rectangular piece of steel to specified dimensions and drill holes in true position.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will lay out and center punch the proper sized plate of rectangular steel for the designated hole location.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly prepare lay out table and scribe layout lines.
3. Load work-holding devices on drill press table, and drill all holes to print specifications in a safe manner.
4. Clean drill press and work area, returning all tools to their proper storage area.

LEVEL I

DRILLING OPERATION

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 1

First Operation:

Step 1. Blue and scribe layout lines for center punch.

2. Prick punch on cross lines.

3, Center punch for center drill.

4. Load part in drill vise and block the vise so it will not spin on table.

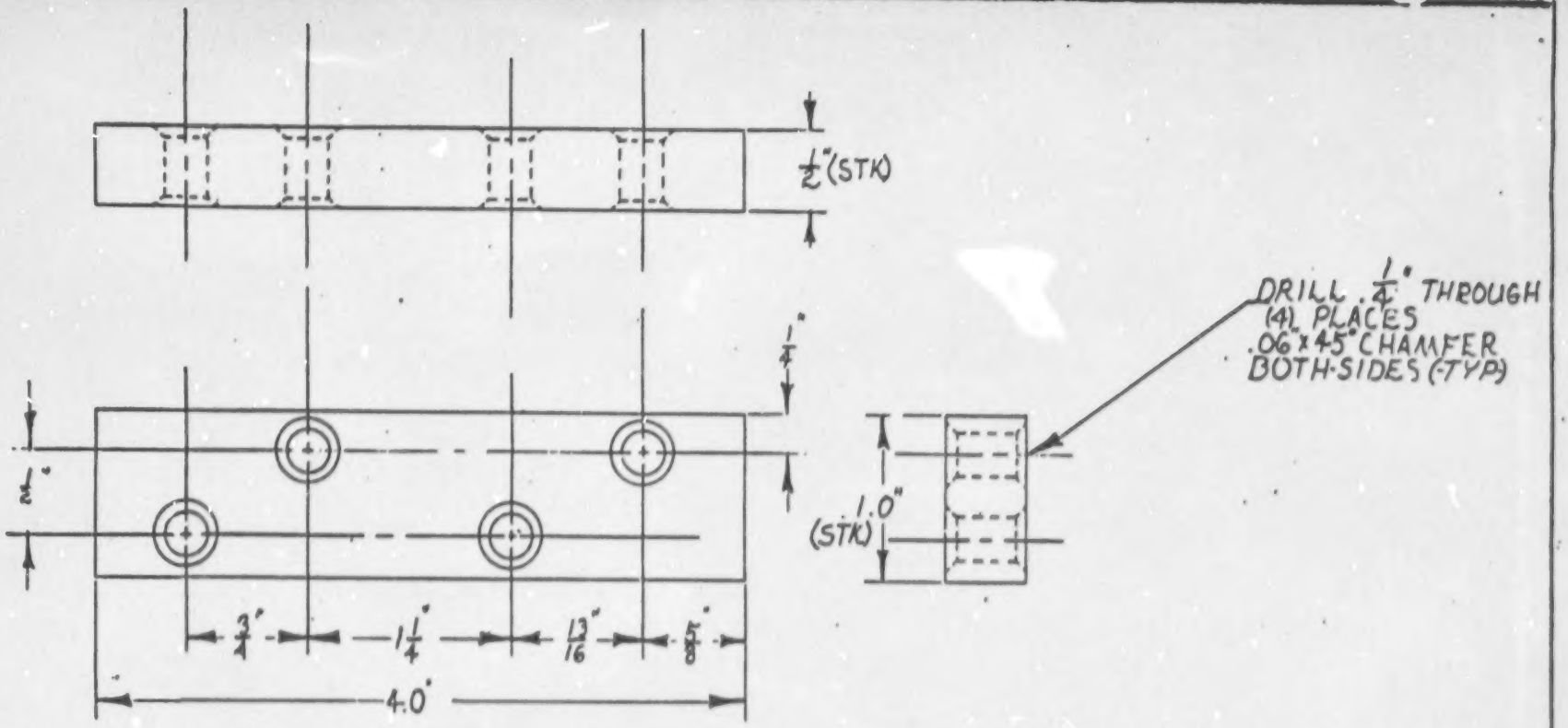
5. Center drill, using #2 center drill for pre-hole drill start.

6. Drill through with ½ inch drill.

7. Countersink 90 degrees by .015".

8. Speeds and feeds will be at instructor's discretion.

9. Break all sharp edges.



NOTE: BREAK ALL SHARP EDGES.

ITEM NO.	QTY.	DESCRIPTION

TOLERANCES NOT SPECIFIED
FRACTIONAL ± 1/64
DECIMAL .X ± .1 .XX ± .01 .XXX ± .015
ANGULAR ±
SURFACE 63

INDIAN HILLS COMM. COLL.

MATERIAL:	SCALE	DRAWN BY
MILD STL. 4.0" x 1/2" x 1.0"	FULL	APPROVED BY

TITLE: PLATE - DRILL PRESS

DATE	DRAWING NUMBER	CHG. LTR.
	606. 682-014: SHT. 3 OF 4	

BEST COPY AVAILABLE

LEVEL II

DRILL PRESS

SAFETY INSTRUCTIONS

1. Use the drill press vise or clamp to hold the work being drilled to prevent the drill from catching into and throwin the work.

2. Grip the vise firmly while drilling to prevent the drill from breaking or the work and vise from revolving dangerously, or clamp the vise to the table.

3. Lessen the feed pressure as the drill cuts through the work. This will decrease the danger of the drill catching the work and causing it to revolve.

4. Stop the machine immediately if the drill catches in a piece of work, causing it to revolve and do not touch the work while it is in the machine.

5. Always use a sharp drill which has been ground appropriately for the material to be cut. Drills which have been improperly gound may dig into the work and throw it.

6. Operate the drill at the correct speed for the size of the drill and the kind of material. If too much speed is used, or if the drill is forced too rapidly into the material, the drill will break.

7. Remove the chuck key from the chuck and the drift from the spindle before turning on the power to prevent them from flying.

8. Stop the machine before removing work, chips, or cuttings. Avoid deep, painful cuts by using a brush to remove chips.

9. Be sure that the drill is securely fastened and is centered in the chuck before turning on the power.

10. Keep face away from the work being drilled to prevent injury to eyes or face in case the drill breaks or hot oil and chips fly out.

LEVEL II

DRILL PRESS

TASK OPERATION SHEET

COMPETENCY NO. 2

Center Drilling, Drilling, Reaming, Counter Boring and Countersinking.

1. Objective:

   To develop skills in a more complex drill press operation.

2. Equipment:

   Single-spindle drill press.

3. Material:

   4" long by 2" wide by 1/2" thick plate of steel.

4. Tools required:

A.	6" machinist scale	F.	#3 center drill
B.	12" combination	G.	4 1/2" Jacob's chucks
C.	Metal scribe	H.	31/64" drill
D.	Center punch	I.	90° countersink
E.	Ball peen hammer	J.	1/2" reamer

5. Reference:

   Operational sequence sheet
   Blueprint sheet
   Safety sheet

6. Information:

   Student may request instructions. All tooling will be furnished.
   Safety sheet

7. Safety:

   All previous safety instructions will apply for this operation.

LEVEL II

DRILL PRESS

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 2

Layout, Center Drilling, Drilling, Countersinking

First Operation:

Step 1. Use layout bench; coat plate steel with Dykem.

2. Scribe layout lines, using combination square.

3. Center punch cross lines.

4. Center drill on punch marks with in free state.

5. Load part in drill vise.

6. Drill 31/64" holes through.

7. Ream holes to 1/2" diameter.

8. Countersink 90° to 9/16" diameter.

Second Operation:

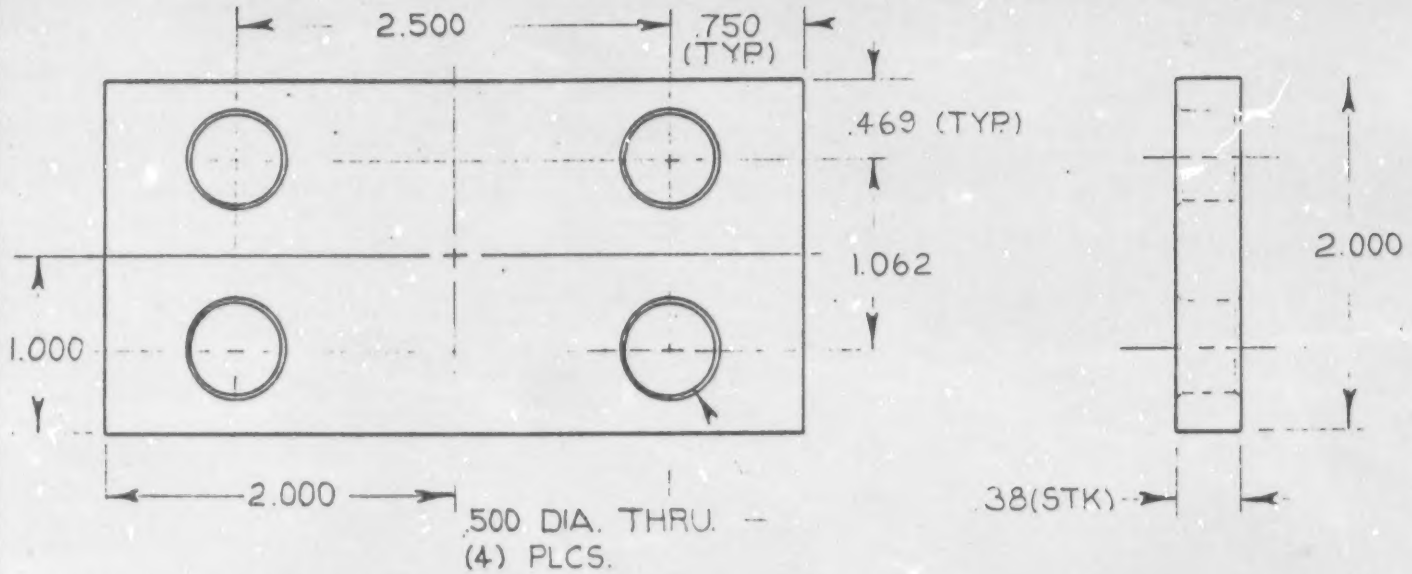
Speed 1. Center drill r.p.m.

2. Drill r.p.m. ____ Feed ____

3. Reamer r.p.m. _____

4 Countersink r.p.m. _____

Step 1. Turn part over, reload in drill vise and countersink back side holes to 9/16" diameter.



NOTES:

1. DEBURR MIN. .005

ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED FRACTIONAL ± 1/64 DECIMAL .X ± .1 .XX ± .02 .XXX ± .005 ANGULAR ± 1° SURFACE 125		INDIAN HILLS COMM. COLL.
		C.R.S. / SCALE FULL / DRAWN BY / APPROVED BY
		TITLE: RECTANGULAR BLOCK
DATE		DRAWING NUMBER 606.683-014 / CHG. LTR.

LEVEL III

DRILL PRESS

SAFETY INSTRUCTIONS

1. Use the drill press vise or clamp to hold the work being drilled to prevent the drill from catching into and throwin the work.

2. Grip the vise firmly while drilling to prevent the drill from breaking or the work and vise from revolving dangerously, or clamp the vise to the table.

3. Lessen the feed pressure as the drill cuts through the work. This will decrease the danger of the drill catching the work and causing it to revolve.

4. Stop the machine immediately if the drill catches in a piece of work, causing it to revolve and do not touch the work while it is in the machine.

5. Always use a sharp drill which has been ground appropriately for the material to be cut. Drills which have been improperly gound may dig into the work and throw it.

6. Operate the drill at the correct speed for the size of the drill and the kind of material. If too much speed is used, or if the drill is forced too rapidly into the material, the drill will break.

7. Remove the chuck key from the chuck and the drift from the spindle before turning on the power to prevent them from flying.

8. Stop the machine before removing work, chips, or cuttings. Avoid deep, painful cuts by using a brush to remove chips.

9. Be sure that the drill is securely fastened and is centered in the chuck before turning on the power.

10. Keep face away from the work being drilled to prevent injury to eyes or face in case the drill breaks or hot oil and chips fly out.

LEVEL III

DRILL PRESS

TASK OPERATION SHEET

COMPETENCY NO. 3

Layout, Drill, Center Drill
Countersink, and Tap

1. Objective:

To develop skills in laying out, drilling, and tapping hole in a circular pattern.

2. Equipment:

Four spindle drill press.

3. Material:

4" long by 4" wide by 3/8" thick plate of steel.

4. Tools Required:

A. 6" machinist scale
B. 6" protractor
C. 6" divider
D. Metal scribe
E. Center punch
F. Ball peen hammer
G. 1/2" Jacob Chuck
H. 29/64" drill
I. 90* countersink
J. 1/2" - 20 tap-lead
K. Can of layout dykem

5. Reference:

Operations Sequence Sheet
Blueprint Sheet
Safety Sheet

6. Information:

Student will perform these operations with a minimum of instruction. All tooling will be furnished.

7. Safety:

All previous safety instructions will apply for this operation.

LEVEL III

OPERATIONAL SEQUENCE SHEET
DRILL PRESS

Operation #5

Step #1. Saw and mill square, to ± 1 degree a 4 x 4 inch plate by 3/8 inch thick.

#2 Using layout bench, coat 4 x 4 plate with dykem.

#3 Use machinery hand book coordinates single layout lines for 6 hole circular hole pattern.

#4 Center punch whre lines intersect and check hole spacing with dividers.

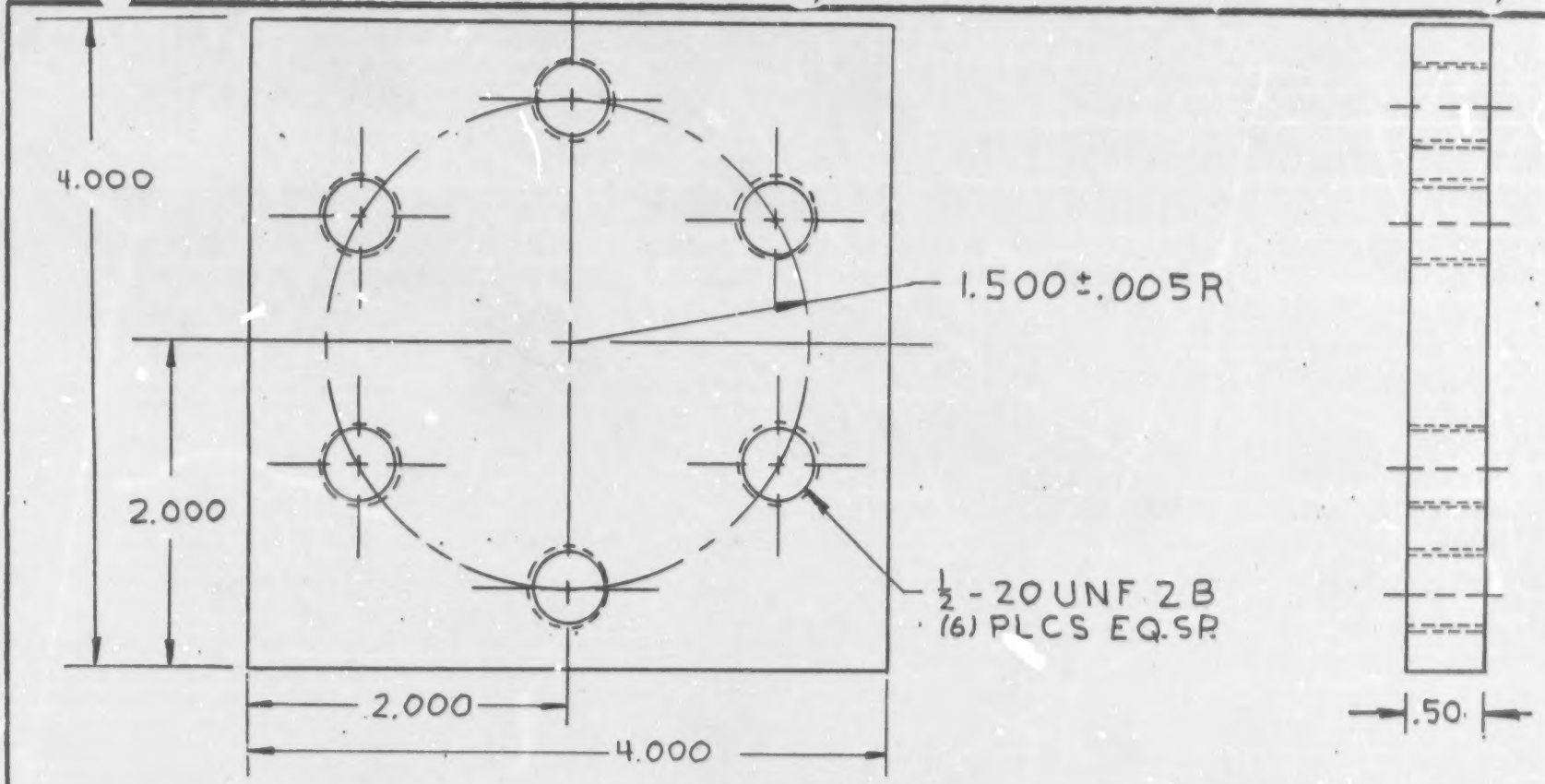
#5 Place part on drill table and center drill 6 places in free state.

#6 Load part in mill vise on parallels and drill 6-29/64 inch.

#7 Countersink 6 holes, both sides in free state to 9/16 diameter.

#8 Tap 6 holes 1/2 - 20 thread through.

#9 Break sharp edges as needed



ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED FRACTIONAL ± DECIMAL .X ± .1 .XX ± .02 .XXX ± .010 ANGULAR ± SURFACE 125		INDIAN HILLS COMM. COLL. SCALE FULL DRAWN BY APPROVED BY C MOORE TITLE PLATE TAPPED DATE DRAWING NUMBER CHG LTR

COMPETENCIES IN OPERATION OF SHAPERS AND PLANERS

SAFETY

Before beginning the demonstration of competencies in using shapers and planers, the student shall:

I. Review the general safety instructions for Machine Trades.

II. Review the specific safety instructions for shapers and planers, which are listed below.

1. Check the shaper ram and tool clearance stroke before turning on the power to prevent the tool or the base of the ram from hitting the table or work.

2. Stop the machine and shut off the power when setting up or changing the tool. Many major accidents have resulted from attempts to perform operations with the machine in motion.

3. To prevent the ram from starting unexpectedly, be sure that the starting lever of the shaper is in neutral position.

4. Keep hands away from cutting tool and the direct line of travel of all moving parts.

5. Remove all wrenches from the machine after the set-up has been completed to prevent them from falling on the feet or being caught in the moving machinery.

6. Do not stand in the front of the machine or lean over the work while the machine is in motion.

7. Move the tool cutting position before starting the machine. Irregular-shaped work may not clear the tool in some areas, thus causing the tool to jam.

8. Do not shift the belt while in operation. It may pull your band or arm into the moving machinery.

9. Wear safety goggles while operating the shaper.

LEVEL I

SHAPER AND PLANER

COMPETENCY NO. 1

TASK:

To produce a rectangular bar from round stock.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up a horizontal shaper and shape as per blueprint specification.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load holding device and part on horizontal shaper table.
3. Load tool in holder and set to proper angle.
4. Load part in shaper vise and perform all operations to print specifications, following prescribed safety precautions.
5. Clean machine and work area and return all tooling to proper storage area.

HORIZONTAL SHAPER

TASK OPERATION SHEET

COMPETENCY NO. 2

1. Objective:

   To develop additional skills in the operations of the horizontal shaper.

2. Equipment required:

   Horizontal shaper

3. Material required:

   Previously shaped rectangular steel bar 1 3/8" by 1 3/8" by 1 3/8" by 3" long.

4. Tools required:

   6" machinist scale
   Vernier protractor

5. Reference:

   Operational sequence sheet
   Blueprint sheet
   Safety sheet

6. Information;

   Student may request instructions. All tools will be furnished.

7. Safety:

   All previous safety instructions on the horizontal shaper will apply for this operation.

LEVEL I

HORIZONTAL SHAPER

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 1

First Operation:

Step 1. Load part in shaper vise, one end up and square to vise.

2. Set table height for tool clearance.

3. Set stroke for length and position.

4. Shape both ends of part to length.

Second Operation:

Step 1. Load part in shaper vise, round side above vise jaws, and shape flat to 1 3/8" wide.

Third Operation:

Step 1. Load in shaper vise flat side down on parallel bars and shape other side to 1 3/8 inch flat.

Fourth Operation:

Step 1. Load in shaper vise flat sides to jaws on parallel bars, and shape to 1 3/8 inch wide.

Fifth Operation:

Step 1. Load in shaper vise, round side up and repeat Operation #20.

2. Inspect for print size.

3. Deburr sharp edges and stock for mill work.

LEVEL I

HORIZONTAL SHAPER

TASK OPERATIONAL SHEET

COMPETENCY NO. 1

1. Objective:

   To develop basic skill in the operation and safety of the horizontal shaper.

2. Equipment required:

   Horizontal shaper

3. Material required:

   3-inch long by 2-inch diameter round bar stock

4. Tools required:

   6-inch machinist scale
   Precision square

5. Reference:

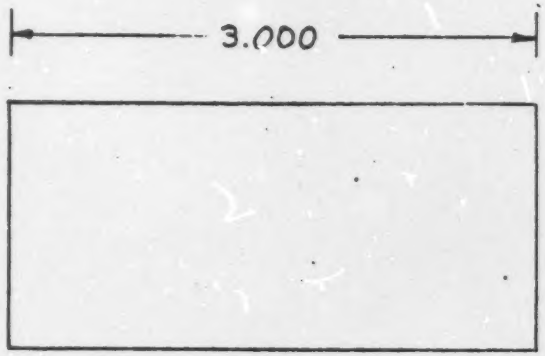
   Operational sequence sheet
   Sketch sheet
   Safety sheet

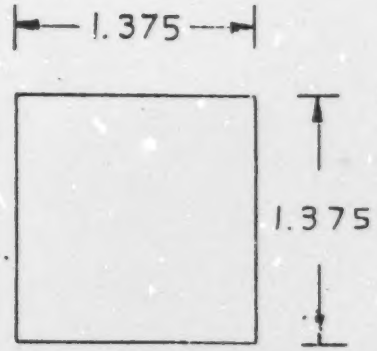
6, Information:

   Student may request a demonstration from instructor or "buddy" student for a first piece part. All tooling will be furnished. The part that is given to the instructor for grade will be final. If a request is made for remake, 5 points will be deducted from grade.

7. Safety:

   Students will receive detailed safety instructions for the horizontal shaper.





NOTE

1. BREAK ALL SHARP EDGES

SAVE PART FOR FUTURE OPERATION

ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED		INDIAN HILLS COMM. COLL.
FRACTIONAL ±		MILD STEEL / SCALE FULL / DRAWN BY / APPROVED BY
DECIMAL .X ± .__ .XX ± .__ .XXX ± .015		TITLE: BLOCK-SHAPER
ANGULAR ±		DATE / DRAWING NUMBER 4 OF 4 / CHG. LTR.
SURFACE ✓125		

LEVEL II

HORIZONTAL SHAPER

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 2

First Operation:

Step 1. Load 1 3/8" by 1 3/8" by 3" long rectangular steel bar from Compency No. 1 Operation in shaper vise vertically 1½".

2. Swing compound in clockwise direction 45 degrees and shape 45 degree angle by 5/8" wide.

3. Swing compound in counter-clockwise direction 45 degrees and shape 45 degree angle on other sid[illegible]eaving an approximate 1/8" flat at center.

Second Operation:

Step 1. Load part with pointed end down in shaper vise, holding on flat sides 90 degrees to vise, out 1 3/4".

2. Swing compound 30 degrees from vertical, clockwise and counter-clockwise, and shape a 60 degree included angle, leaving a 1/8" flat at center.

3. Remove all sharp edges and inspect.

LEVEL II

SHAPER AND PLANER

COMPETENCY NO. 2

TASK:

To produce an angular bar.

CONDITIONS AND LIMITATIONS:

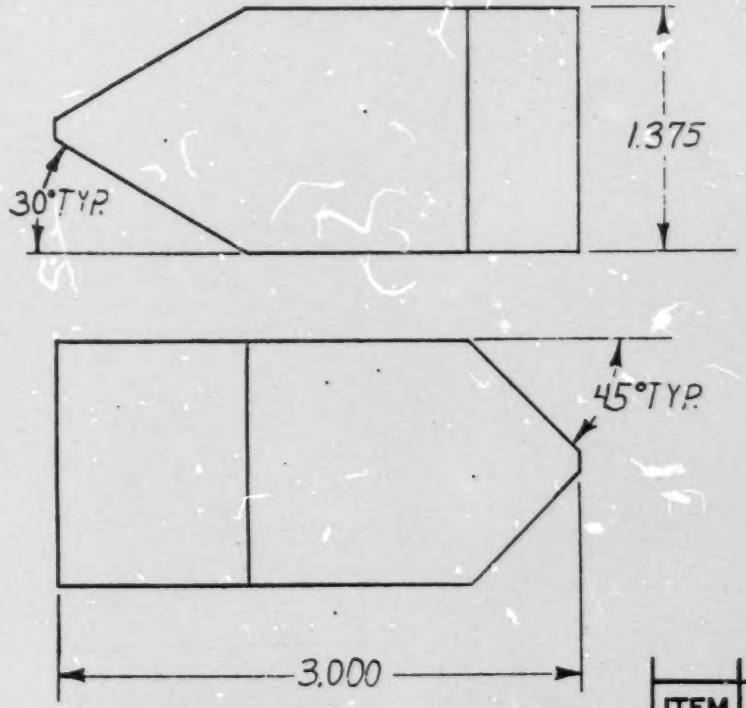
Given the proper tools and equipment, the student will set up a horizontal shaper and cut as per blueprint specification.

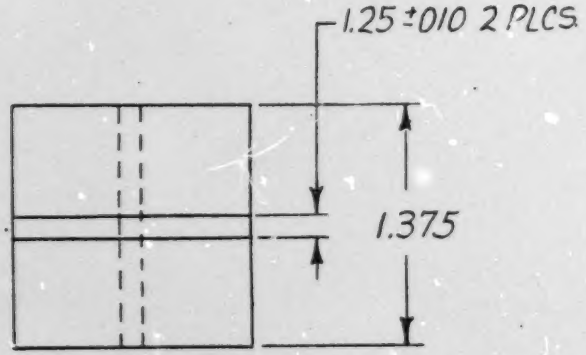
CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of tools and equipment.
2. Properly load tools in holder and part in holding devise on horizontal table.
3. Perform all operations to print specifications, following a prescribed sequence and safety precautions.
4. Clean machine and mark area, returning all tooling to storage area.

NOTE: BREAK ALL SHARP EDGE





ITEM NO.	QTY.	DESCRIPTION

TOLERANCES NOT SPECIFIED
FRACTIONAL ± ~
DECIMAL .X ± ~ .XX ± ~ .XXX ± .015
ANGULAR ± 0° 30'
SURFACE ✓

INDIAN HILLS COMM. COLL.

C.R.S.	SCALE FULL	DRAWN BY
		APPROVED BY

TITLE: WEDGE

DATE	DRAWING NUMBER	CHG. LTR.

LEVEL #3

SHAPER AND PLANER

SAFETY INSTRUCTIONS

1. Check the shaper ram and tool clearance stroke before turning on the power to prevent the tool or the base of the ram from hitting the table or work.

2. Stop the machine and shut off the power when setting up or changing the tool. Many major accidents have resulted from attempts to perform operations with the machine in motion

3. To prevent the ram from starting unexpectedly, be sure that the starting level of the shaper is in neutral position.

4. Keep hands away from cutting tool and the direct line of travel of all moving parts.

5. Remove all wrenches from the machine after the set-up has been completed to prevent them from falling on the feet or being caught in the moving machinery.

6. Do not stand in the front of the machine or lean over the work while the machine is in motion.

7. Move the tool cutting position before starting the machine. Irregular shaped work may not clear the tool in some areas, thus causing the tool to jam.

4. Do not shift the belt while in operation. It may pull your hand or arm into the moving machinery.

9, Wear safety goggles while operating the shaper.

HORIZONTAL SHAPER

TASK OPERATION SHEET

COMPETENCY NO. 3

1. Objective:

   To develop a more in depth skill in the operation of a shaper.

2. Equipment required:

   Horizontal shaper

3. Material required:

   Over-piece of triangular plate steel ½" thick by 3¼" long on two sides.

4. Tools required:

   6" machinist scale
   6" vernier caliper
   Precision square
   10" flat mill file
   Vernier protractor

5. References:

   Operational sequence sheet
   Blueprint sheet
   Safety sheet

6. Information:

   Student may request a limited amount of aid from instructor for a flat piece. All tools will be furnished.

7. Safety:

   All previous safety instructions will apply for this operation.

LEVEL III

SHAPERS AND PLANERS

COMPETENCY NO. 3

TASK:

To produce a right-angle block.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up and shape to size prescribed piece.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load tool holder and load part in shaper vise.
3. Set proper angle of tool holder
4. With part loaded in shaper vise, perform all operations in a safe and prescribed manner.
5. Clean machine and work area, returning all tooling to storage area.

LEVEL III

HORIZONTAL SHAPER

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 3

First Operation:

Step 1. Cut 3¼" by 3¼" by ½" thick steel plate.

2. Saw part diagonally to make two pieces of stock.

Second Operation:

Step 1. Load a triangular piece in shaper vise and square one side to clean up.

Third Operation:

Step 1. Turn part in shaper vise and square to 3 inches.

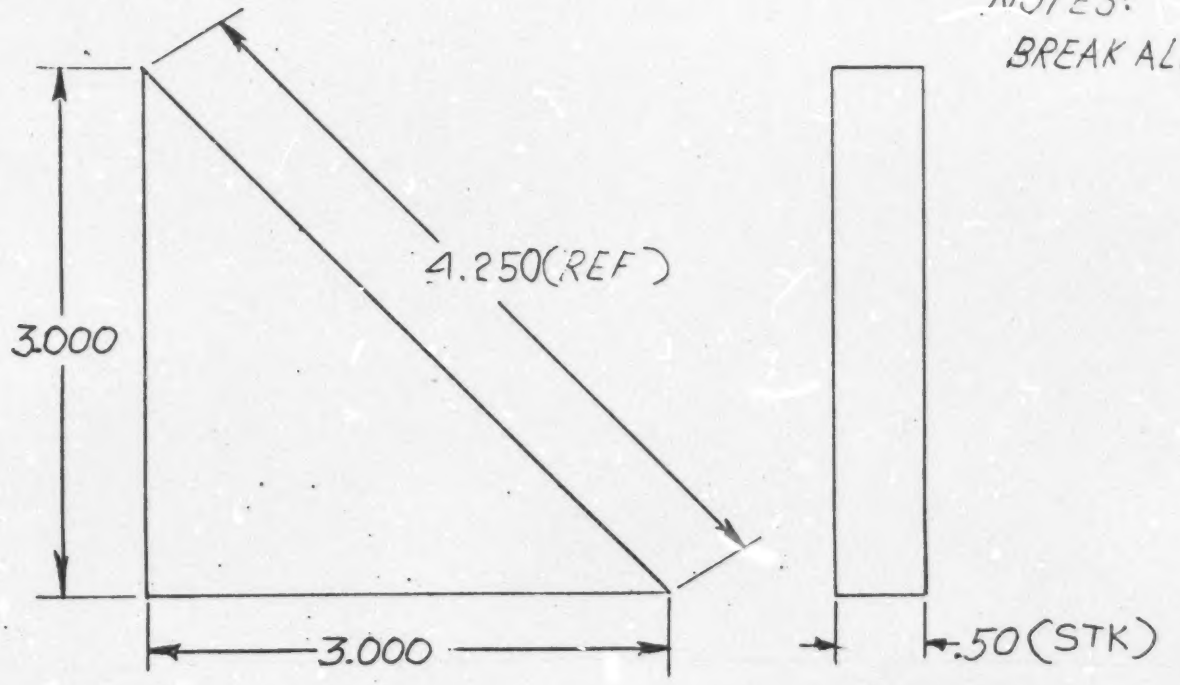
Fourth Operation:

Step 1. Using protractor, load part on point of 39-degree angle and cut to straighten.

2. Check hypotenuse length for reference print dimension, approximately 4¼ inches.

3. Break all sharp edges.

NOTES:
BREAK ALL SHARP EDGES.010



ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED		INDIAN HILLS COMM. COLL.
FRACTIONAL ± ~		DESIGN I — SCALE FULL — DRAWN BY — APPROVED BY
DECIMAL .X ± .1 .XX ± .02 .XXX ± .005		TITLE: RIGHT ANGLE BLOCK
ANGULAR ± ~		DATE — DRAWING NUMBER — CHG. LTR.
SURFACE 125		

-58-

LEVEL IV

SHAPER AND PLANER

SAFETY INSTRUCTIONS

1. Check the shaper ram and tool clearance stroke before turning on the power to prevent the tool or the base of the ram from hitting the table or work.

2. Stop the machine and shut off the power when setting up or changing the tool. Many major accidents have resulted from attempts to perform operations with the machine in motion

3. To prevent the ram from starting unexpectedly, be sure that the starting level of the shaper is in neutral position.

4. Keep hands away from cutting tool and the direct line of travel of all moving parts.

5. Remove all wrenches from the machine after the set-up has been completed to prevent them from falling on the feet or being caught in the moving machinery.

6. Do not stand in the front of the machine or lean over the work while the machine is in motion.

7. Move the tool cutting position before starting the machine. Irregular shaped work may not clear the tool in some areas, thus causing the tool to jam.

4. Do not shift the belt while in operation. It may pull your hand or arm into the moving machinery.

9, Wear safety goggles while operating the shaper.

HORIZONTAL SHAPER

TASK OPERATION SHEET

COMPETENCY NO. 4

1. Objective:

   To develop a more complex skill using the horizontal shaper.

2. Equipment required:

   Horizontal shaper

3. Material required:

   A previously shaped piece of rectangular bar stock 3" long by 1 3/8" square.

4. Tools required:

   6" Machinist scale
   6" vernier protractor
   Bevel protractor
   10" flat file
   Dial indicator

5. Reference:

   Operational sequence sheet
   Blueprint sheet
   Safety sheet

6. Information:

   Student may request verbal instruction. All tooling will be furnished.

7. Safety:

   All previous safety instructions will apply for this operation.

SHAPER AND PLANER

COMPETENCY NO. 4

TASK:

To produce a VEE block, using the shaper.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up a horizontal shaper and shape material to a finished part configuration.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load part in holding device on shaper table.
3. Load tool in holder set to proper angle.
4. With part loaded in shaper vise, shape part to prescribed dimensions in a safe manner.
5. Clean machine and work area, returning all tools to storage area.

HORIZONTAL SHAPER

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 4

First Operation:

Step 1. Saw 3-inch long by 1 3/8 inch square rectangular bar stock.

Second Operation:

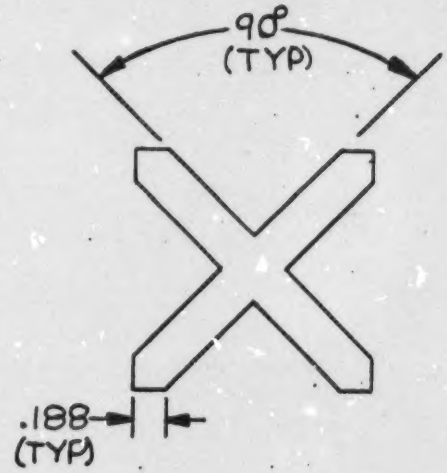
Step 1. Load in shaper vise; hold on flat sides; indicate for flatness.

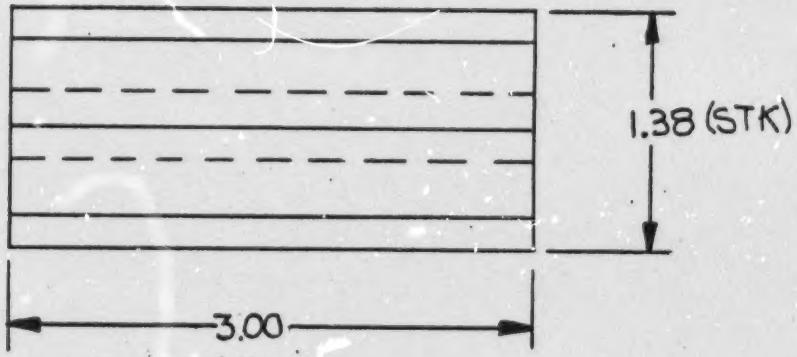
2. Use compound set at 45 degrees and shape vee slot as per sketch, holding .1875" dimension.

Third Operation:

Step 1. Turn part over and repeat Second Operation. Continue this operation until all sides are completed as per sketch.

1. Break all sharp edges and inspect.





NOTE: BREAK ALL SHARP EDGES

ITEM NO.	QTY.	DESCRIPTION
TOLERANCES NOT SPECIFIED FRACTIONAL ± DECIMAL .X ± . .XX ± . .XXX ± .010 ANGULAR ± 0° 30' SURFACE ✓125		INDIAN HILLS COMM. COLL. SCALE FULL DRAWN BY APPROVED BY TITLE "V"-BLOCK 1 3/8" SIZE DATE DRAWING NUMBER CHG. LTR.

COMPETENCIES IN OPERATION OF GRINDING MACHINES

Safety

Before beginning the demonstration of competencies in using a grinding machine, the student shall:

I. Review the general safety instructions for Machine Trades.

II. Review the specific safety instructions for grinding machine operations.

GRINDING MACHINE SAFETY PRECAUTIONS

1. Wear safety glasses at all times when performing any grinding operation, even though the wheel has a glass shield.

2. Always test grinding wheels for possible cracks. Tap the wheel with a wood object such as screwdriver handle. A solid wheel will sound a clear ring; a damaged wheel will have a dull sound.

3. Guard against excessive wheel speed. Check the Table of Grinding Wheel Speeds for the correct speed. This speed should not be exceeded with new wheels. As wheels wear to smaller diameter, the r.p.m. may be safely increased.

4. Do not operate the grinder unless all guards are in place and the wheel is secure on the spindle.

5. Before starting the machine, make sure the workpiece is properly mounted, that the footstock is locked in position and that the drive plate and dog are correctly adjusted.

6. Use the proper wheel specified for the job.

7. After starting the machine, always step back from the rotating wheel.

8. Don't feed the wheel too fast; the workpiece may be forced from between centers.

9. When shoulder grinding, do not permit the side of the wheel to press too hard against the work. The work may be forced from between centers or the wheel may break from excessive side pressure.

10. Stop all motors before making adjustments to the machine.

COMPETENCIES IN OPERATION OF GRINDING MACHINES

GRINDING MACHINE SAFETY PRECAUTIONS (CONT'D)

11. When dressing the wheel, make sure the diamond is securely locked in position.

12. Never hand gauge the work while it is turning.

13. When mounting or removing work, back the wheel far enough away to provide adequate clearance for your hands.

14. Never wear long-sleeved shirts, neckties, jewelry, or anything else which might get caught in the machine.

15. When leaving the grinder for an indefinite period, stop the machine.

LEVEL I

SURFACE GRINDER

TASK OPERATION SHEET

COMPETENCY NO. 1

1. Objective:

   To develop basic skills in the operation of precision grinding.

2. Equipment:

   Horizontal spindle surface grinder.

3. Material:

   2" long by 1" wide by ½" thick rectangular bar of steel.

4. Tools required:

   A. 6" machinist scale
   B. 0 - 1" micrometer
   C. Dial indicator
   D. Angle plate
   E. Height gauge
   F. Clean shop towel

5. Reference:

   Operational sequence sheet
   Print sheet
   Safety sheet

6. Information:

   Student may request a demonstration from instructor or "buddy" student for a first piece part. All tooling will be furnished. The part that is given to the instructor for grade will be final. If a request is made for remake, 5 points will be deducted from grade.

7. Safety

   All students will receive detailed safety instructions for the surface grinder.

LEVEL I

GRINDING MACHINES

COMPETENCY NO. 1

TASK:

To precisely grind the surfaces of a rectangular block.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set a rectangular table surface grinder and grind the workpiece to print specifications.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the proper use of given tools and equipment.
2. Properly load and block part on holding device of grinder table.
3. Dress wheel and check coolant supply.
4. Following prescribed safety instructions, grind the part to print specifications.
5. Clean work area and machine returning all tools to proper storage area.

SURFACE GRINDER

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 1

First Operation:

Step 1. Load part on angle plate, using C-clamps on surface plate.

2. Load above surface of angle plate and using height gauge with indicator, indicate underside of part for straightness with layout table.

3. Load on cleaned magnetic grinder table and set table and cross feed stops and grind to clean up.

Second Opeation:

Step 1. Turn part over and repeat all steps in first operation to grind other side.

Third Operation:

Step 1. Load part on angle plate with one and 1/3 inch above plate. Turn angle plate and indicate on ground side to zero reading on indicator. Grind end to clean up.

Fourth Operation:

Step 1. Turn part over and repeat third operation, grinding to print size.

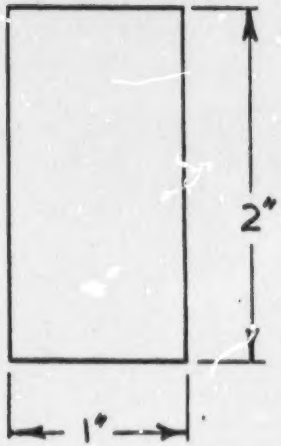
Fifth Operation:

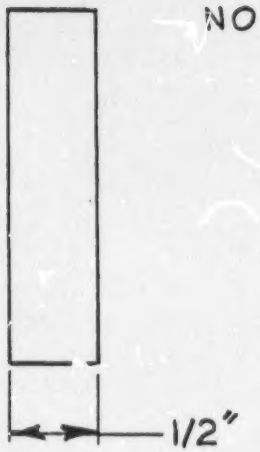
Step 1. Place part on cleaned magnetic table and block both ends.

2. Grind flat side to clean up.

Sixth Operation:

Step 1. Turn part over and repeat fifth operation; grind other side to clean up.





NOTE: BREAK ALL SHARP EDGES

ITEM NO.	QTY.	DESCRIPTION

TOLERANCES NOT SPECIFIED
FRACTIONAL ± 1/32
DECIMAL .X ± .__ .XX ± .__ .XXX ± .__
ANGULAR ± __
SURFACE 32 ✓

INDIAN HILLS COMM. COLL.

MATERIAL: MILD STEEL 1X2X.5 | SCALE FULL | DRAWN BY | APPROVED BY

TITLE: BLOCK-SURFACE GRINDER

DATE | DRAWING NUMBER 603.685-062 PAGE 4 OF 4 | CHG. LTR.

LEVEL II

GRINDING MACHINES
SAFETY INSTRUCTIONS

1. Wear safety glasses at all times when performing any grinding operation, even though the wheel has a glass shield.

2. Always test grinding wheels for possible cracks. Tap the wheel with a wood object such as a screw driver handle. A solid wheel will sound a clear ring; a damaged wheel will have a dull sound.

3. Guard against excessive wheel speed. Check the Table of Grinding Wheel Speeds for the correct speed. This speed should not be exceeded with new wheels. As wheels wear to smaller diameter, the rpm may be safely increased.

4. Do not operate the grinder unless all guards are in place and the wheel is secure on the spindle.

5. Before starting the machine, make sure the workpiece is properly mounted, that the footstock is locked in position and that the drive plate and dog are correctly adjusted.

6. Use the proper wheel specified for the job.

7. After starting the machine, always step back from the rotating wheel.

8. Don't feed the wheel too fast; otherwise, the workpiece may be forced from between centers.

9. When shoulder grinding, do not permit the side of the wheel to press too hard against the work. The work may be forced from between centers or the wheel may break from excessive side pressure.

10. Stop all motors before making adjustments to the machine.

11. When dressing the wheel, make sure the diamond is securely locked in position.

12. Never hand guage the work while it is turning.

13. When mounting or removing work, back the wheel far enough away to provide adequate clearance for your hands.

14. Never wear long sleeved shirts, neckties, jewelry, or anything else which might get caught in the machine when operating a grinder.

15. When leaving the grinder for an indefinite period, stop the machines.

LEVEL II

SURFACE GRINDER

TASK OPERATION SHEET

COMPETENCY NO. 2

1. Objective:

   To develop additional skills in the operations of the surface grinder.

2. Equipment:

   Horizontal spindle surface grinder.

3. Material required:

   1" by 1" square by 2" long piece of bar stock.

4. Tools required:

   A. 6" machinist scale

   B. 0" to 1" micrometer

   C. Precision square

   D. Shop towel

5. Reference:

   Operational sequence sheet

   Blueprint sheet

   Safety sheet

6. Information:

   Student may request instructions. All tooling will be furnished.

7. Safety:

   All previous safety instructions will apply for this operation on the grinder.

LEVEL II

GRINDING MACHINE

COMPETENCY NO. 2

TASK:

To precisely grind a rectangular steel block.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up a rectangular table surface grinder and grind part to print specifications.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the proper use of given tools and equipment.
2. Properly load and block part on holding device of grinder table.
3. Dress wheel, check lubricant and coolant supply.
4. Following proper sequence and safety instructions, grind part to print specifications.
5. Clean work area and machine, returning all tools to storage area.

LEVEL II

SURFACE GRINDER

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 2

First Operation:

Step: 1. Load part and block ends centrally on cleaned magnetic chuck in horizontal position.

2. Grind part to clean it up.

Second Operation:

Step 1. Load part and block ends on cleaned magnetic chuck ground side down. Locate as before.

1. Grind to .975" dimension.

Third Operation:

Step 1. Load part and block ends on cleaned magnetic chuck with underground side up, centrally located as before.

2. Grind to clean up.

Fourth Operation:

Step 1. Load part and block ends on cleaned magnetic chuck with unground side up, centrally located.

2. Grind to .950" dimension.

Fifth Operation:

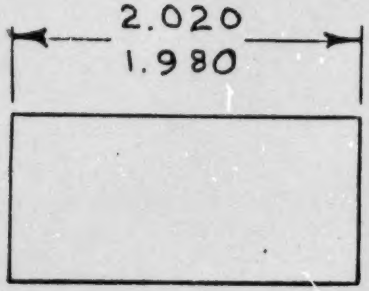
Step 1. Load part on angle plate with C-clamp. Square to sides.

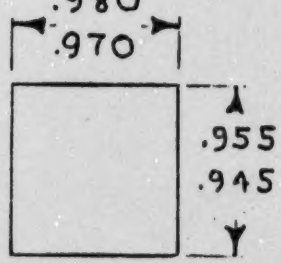
Step 2. Load angle plate on magnetic table and grind end to clean up.

Sixth Operation:

Step 1. Load parts on angle plate, unground end up, square to sides and grind to clean up.

Note: Finish to be .32 all over with pocket.
Break all sharp edges with pocket hone.





NOTE: BREAK ALL SHARP EDGES

ITEM NO.	QTY.	DESCRIPTION

TOLERANCES NOT SPECIFIED
FRACTIONAL ±
DECIMAL .X ±. .XX ±. .XXX ±.
ANGULAR ±
SURFACE 32

INDIAN HILLS COMM. COLL.

MATERIAL: COLD ROLLED STEEL | SCALE FULL | DRAWN BY | APPROVED BY

TITLE: SURFACE GRINDER

DATE | DRAWING NUMBER 603.685-062 | CHG LTR

LEVEL III

GRINDING MACHINES
SAFETY INSTRUCTIONS

1. Wear safety glasses at all times when performing any grinding operation, even though the wheel has a glass shield.

2. Always test grinding wheels for possible cracks. Tap the wheel with a wood object such as a screw driver handle. A solid wheel will sound a clear ring; a damaged wheel will have a dull sound.

3. Guard against excessive wheel speed. Check the Table of Grinding Wheel Speeds for the correct speed. This speed should not be exceeded with new wheels. As wheels wear to smaller diameter, the rpm may be safely increased.

4. Do not operate the grinder unless all guards are in place and the wheel is secure on the spindle.

5. Before starting the machine, make sure the workpiece is properly mounted, that the footstock is locked in position and that the drive plate and dog are correctly adjusted.

6. Use the proper wheel specified for the job.

7. After starting the machine, always step back from the rotating wheel.

8. Don't feed the wheel too fast; otherwise, the workpiece may be forced from between centers.

9. When shoulder grinding, do not permit the side of the wheel to press too hard against the work. The work may be forced from between centers or the wheel may break from excessive side pressure.

10. Stop all motors before making adjustments to the machine.

11. When dressing the wheel, make sure the diamond is securely locked in position.

12. Never hand guage the work while it is turning.

13. When mounting or removing work, back the wheel far enough away to provide adequate clearance for your hands.

14. Never wear long sleeved shirts, neckties, jewelry, or anything else which might get caught in the machine when operating a grinder.

15. When leaving the grinder for an indefinite period, stop the machines.

SURFACE GRINDER

TASK OPERATION SHEET

COMPETENCY NO. 3

1. Objective

   To develop a more complex skill in the operation of the surface grinder.

2. Equipment:

   Horizontal spindle surface grinder

3. Material required:

   1" by 1" square by 2" long piece of bar stock.

4. Tools required:

   A. 6" vernier caliper
   B. 0" to 1" micrometer
   C. Precision square
   D. Vernier protractor
   E. Small angle vise

5. Reference:

   Operational sequence sheet

   Blueprint sheet

   Safety sheet

6. Information:

   Student may request instructions. All tooling will be furnished.

7. Safety:

   All previous safety instructions will apply for this operation on the surface grinder.

GRINDING MACHINES

COMPETENCY NO. 3

TASK:

To produce a ground angle block.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up a rectangular table surface grinder and grind part to print specifications.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the proper use of given tools and equipment.
2. Properly load and lock part on magnetic table of grinder.
3. Dress wheel and check coolant supply.
4. Following prescribed sequence and safety instructions, grind part to print dimensions.
5. Clean machine and work area, returning all tools to storage.

SURFACE GRINDER

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 3

First Operation:

Step 1. Saw a 1 inch square by 2 1/32 inch long piece of bar stock.

2. Load part on end in vise C-clamped to angle plate square to table, and then load on magnetic table and grind end to clean up.

Second Operation:

Step 1. Turn part over and grind other end square to table and hold print dimensions.

Third Operation:

Step 1. Lay part on side on magnetic tabl and block, then grind to clean up.

Fourth Operation:

Step 1. Turn part 180 degrees and grind this side, holding .975" print dimensions.

Fifth Operation:

Step 1. Load part on angle plate square to table and grind side to clean up.

Sixth Operation:

Step 1. Place part on finished side on magnetic table, block and grind to .965" print dimensions.

Seventh Operation:

Step 1. Using 5-inch sine bar on surface plate, lay out 20 degree angles.

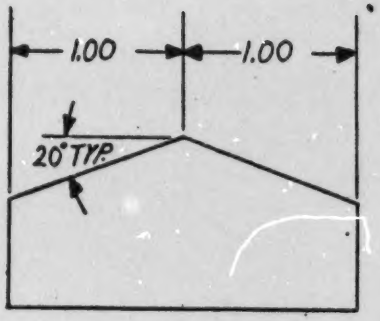
2. Load part on 5-inch sine plate and grind 20 degree angle on first side, holding approximately 1 inch long.

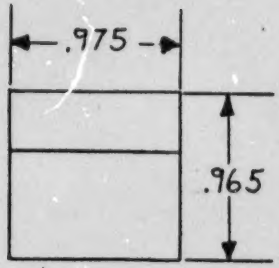
Operation #35

Step 1. Turn part on sine plate and grind 20 degree angle on opposite side.

2. Break all sharp edges with pocket hone.

NOTE
BREAK ALL SHARP EDGES
ALL SIDES SQUARE WITHIN ±1°





ITEM NO.	QTY.	DESCRIPTION

TOLERANCES NOT SPECIFIED
FRACTIONAL ± 1/64
DECIMAL .X ± .1
.XX ± .02
.XXX ± .005
ANGULAR ± 1°
SURFACE 32

INDIAN HILLS COMM. COLL.

MATERIAL CRS. | SCALE FULL | DRAWN BY | APPROVED BY

TITLE "V" WEDGE

DATE | DRAWING NUMBER | CHG. LTR.

GRINDING MACHINES
SAFETY INSTRUCTIONS

1. Wear safety glasses at all times when performing any grinding operation, even though the wheel has a glass shield.

2. Always test grinding wheels for possible cracks. Tap the wheel with a wood object such as a screw driver handle. A solid wheel will sound a clear ring; a damaged wheel will have a dull sound.

3. Guard against excessive wheel speed. Check the Table of Grinding Wheel Speeds for the correct speed. This speed should not be exceeded with new wheels. As wheels wear to smaller diameter, the rpm may be safely increased.

4. Do not operate the grinder unless all guards are in place and the wheel is secure on the spindle.

5. Before starting the machine, make sure the workpiece is properly mounted, that the footstock is locked in position and that the drive plate and dog are correctly adjusted.

6. Use the proper wheel specified for the job.

7. After starting the machine, always step back from the rotating wheel.

8. Don't feed the wheel too fast; otherwise, the workpiece may be forced from between centers.

9. When shoulder grinding, do not permit the side of the wheel to press too hard against the work. The work may be forced from between centers or the wheel may break from excessive side pressure.

10. Stop all motors before making adjustments to the machine.

11. When dressing the wheel, make sure the diamond is securely locked in position.

12. Never hand guage the work while it is turning.

13. When mounting or removing work, back the wheel far enough away to provide adequate clearance for your hands.

14. Never wear long sleeved shirts, neckties, jewelry, or anything else which might get caught in the machine when operating a grinder.

15. When leaving the grinder for an indefinite period, stop the machines.

LEVEL IV

SURFACE GRINDER

TASK OPERATION SHEET

COMPETENCY NO. 4

1. Objective:

   To develop precision skills in the operation of the surface grinder.

2. Equipment:

   Horizontal spindle surface grinder.

3. Material required:

   A milled and or shaped hardened V block.

4. Tools required:

   1" to 2" O.D. micrometer
   Precision square
   Height gauge
   Dial indicator
   5" sine bar
   Set of gauge blocks

5. Reference:

   Operational sequence sheet
   Blueprint sheet
   Safety sheet

6. Information:

   Student may request limited aid in verbal form from instructor. All tooling will be furnished.

7. Safety:

   All previous safety insrructions will apply to this operation on the surface grinder.

LEVEL IV

GRINDING MACHINES

COMPETENCY NO. 4

TASK:

Produce a ground angle block.

CONDITIONS AND LIMITATIONS:

Given the proper tools and equipment, the student will set up and perform all milling operations to a finished part configuration.

CRITERIA OF ACCEPTABLE PERFORMANCE:

The student will:

1. Identify and describe the use of given tools and equipment.
2. Properly load tooling and holding device on grinding table in a prescribed manner.
3. Perform all grinder operations to specifications and in a safe manner.
4. Clean machine and work area, returning all tools to storage area.

LEVEL IV

SURFACE GRINDER

OPERATIONAL SEQUENCE SHEET

COMPETENCY NO. 4

First Operation:

Step 1. Load pre-milled V-block in angle vise or on angle plate on inspection table and square side to plate.

2. Load vise or angle plate on cleaned magnetic table and grind first end to clean up.

Second Operation:

Step 1. Repeat first operation and grind second end to print.

Third Operation:

Step 1. Load part in angle vise or on angle plate flat and square to ground ends.

2. Load vise or angle plate on clean magnetic table, and grind .015 off of top, holding $\sqrt{32}$ finish.

Fourth Operation:

Step 1. Load ground side and properly block part on clean magnetic table.

2. Grind holding 1.500" dimension and $\sqrt{32}$ finish.

Fifth Operation:

Step 1. Load part in angle vise or angle plate with one unfinished side up.

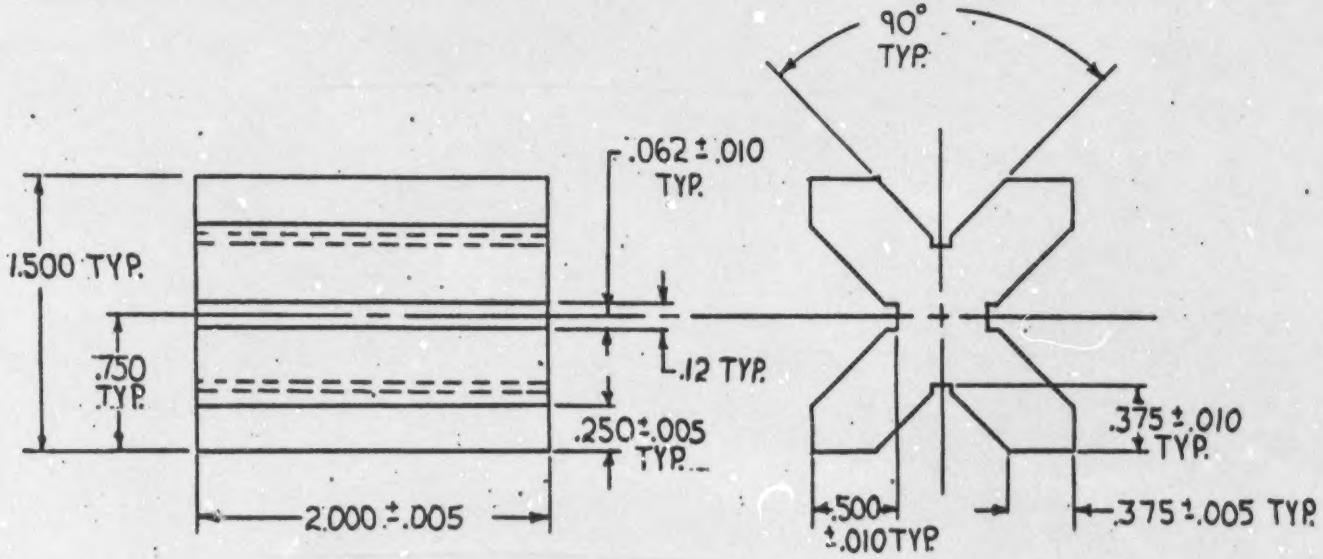
2. Grind off .015" stock, holding $\sqrt{32}$ finish.

Sixth Operation:

1. Load properly blocked part on cleaned magnetic table.

2. Grind to 1.500" dimension, holding $\sqrt{32}$ finish.

3. Break all sharp edges with pocket hone.



NOTES:

1. BREAK ALL SHARP EDGES
2. HEAT TREAT: 1450 DEGREES - OIL QUENCH.
3. TEMPER: 450 DEGREES - OIL QUENCH.

BEST COPY AVAILABLE

ITEM NO.	QTY.	DESCRIPTION

TOLERANCES NOT SPECIFIED
FRACTIONAL ±
DECIMAL .X ± .2 .XX ± .02 .XXX ± .002
ANGULAR ± 0° 30'
SURFACE √ 32

INDIAN HILLS COMM. COLL.

SCALE FULL | DRAWN BY | APP'D BY 138

TITLE VEE-BLOCK

DATE | DRAWING NUMBER - | CHG. LTR.

IX. ENABLING TASKS

ENABLING TASKS

Enabling tasks are those activities necessary for developing job skills. Completion of enabling tasks for a competency leads to achievement of that competency. They may become daily or weekly lesson plans if teachers develop criteria similar to those developed for the competencies. Each of these enabling tasks have been suggested by the participating task force members and reviewed by appropriate private sector representatives.

LEVEL I

LATHE

Enabling Tasks for

COMPETENCY NO. 1

Identify and measure stock

Identify and read 0 to 1 inch outside diameter micrometer

Identify and read 6 inch machinist's scale

Identify and use right hand turning tool

Identify and use 10 inch flat machine file

Identify and use #2 center drill

Identify and use 31/64 inch drill

Identify and use ½ inch reamer

Identify and use 45° chamfer tool

Identify and use knurling tool

Identify and use left hand turning tool

Identify and use 3-jaw chuck

Identify and use ½ inch Jacob's chuck

Identify and use mill file

LEVEL II

LATHE

Enabling Tasks for

COMPETENCY NO. 2

Identify and measure stock

Identify and read 6" machinist scale

Identify and use a right-hand turning tool

Identify and use a flat mill file

Understand setting and cutting a taper by the compound rest method

Understand setting and cutting a taper by the taper attached method

LEVEL III

LATHE

Enabling Tasks for

COMPETENCY NO. 3

Identify and measure stock

Identify and read 6" vernier calipers

Identify and read 6" machinist scale

Identify and use No. 2 center drill

Identify and use 31/64" drill bit

Identify and use ½" reamer

Identify and use ½" Jacobs chuck and key

Identify and use left-hand turning tool

Identify and use boring tool

Identify and use flat mill file

LEVEL IV

LATHE

Enabling Tasks for

COMPETENCY NO. 4

Identify and measure stock

Identify and use right-hand turning tool

Identify and use thread relief tool

Identify and use chamfer tool

Identify and use threading tool

Understand how to and set compound rest for thread cutting

Understand how to set and use dials and split nut lever

Identify and use file

LEVEL I

HORIZONTAL MILLING MACHINE

Enabling Tasks for

COMPETENCY NO. 1.

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 0 to 1 inch micrometer

Identify and use 3/4" stagger tooth mill cutter

Identify and use mill vise

Identify and use parallel bars

Identify and use mill file

LEVEL II

HORIZONTAL MILLING MACHINE

Enabling Tasks for

COMPETENCY NO. 2

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 0" to 1" micrometer

Identify and use 10" flat mill file

Demonstrate how to load and use index head - indicate in parallel to table

Demonstrate how to determine proper hole pattern and how to select proper plate for index head

LEVEL III

HORIZONTAL MILLING MACHINE

COMPETENCY NO. 3

Identify and measure stock

Identify and read 6" machinist scale

Identify and read depth micrometer

Identify and use 10" flat file

Identify and use ½" stagger tooth cutter

Indicate vise parallel to table

LEVEL I

DRILL PRESS

Enabling Tasks for

COMPETENCY NO. 1

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 12" combination square

Identify and use metal scribe

Identify and use center punch

Identify and use #3 center drill

Identify and use ½" drill

Identify and use ball peen hammer

Identify and use ½" Jacob's Chuck

Identify and use prick punch

Identify and use drill vise

Identify and use ¼" drill

Identify and use 90 degree countersink

Indentify and use mill file

LEVEL II

DRILL PRESS

Enabling Task for

COMPETENCY NO. 2

Identify and measure stock

Identify and read 6" machinist scale

Identify and use 12" combination square

Identify and use metal scribe

Identify and use center punch

Identify and use ball peen hammer

Identify and use #3 center drill

Identify and use 4½" Jacob's Chuck

Identify and use 31/64" drill bit

Identify and use 90° countersink

Identify and use ½" reamer

LEVEL III

DRILL PRESS

Enabling Tasks for

COMPETENCY NO. 3

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 6" protractor

Identify and use 6" dividers

Identify and use metal scriber

Identify and use center punch

Identify and use ball peen hammer

Identify and use ½" Jacob's chuck

Identify and use 29/64" drill bil

Identify and use 90° countersink

Indentify and use ½" - 20 lead tap

Identify and use layout Dykem

Understand how to figure and lay out a 6 hole bolt-hole circle

LEVEL I

SHAPER AND PLANER

Enabling Tasks for

COMPETENCY NO. 1

Identify and measure stock

Identify and read 6" machinist scale

Identify and use a precision square

Identify and use mill file

Understand heel clearance and tool geometry

Identify proper holder for angle cutting

HORIZONTAL SHAPER

Enabling Tasks for

COMPETENCY NO. 2

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 6" vernier calipers

Identify and use precision square

Identify and use 10" flat mill file

Identify and read vernier protractor

Comprehend a sequence sheet

LEVEL III

HORIZONTAL SHAPER

Enabling Tasks for

COMPETENCY NO. 3

Identify and measure stock

Identify and read 6" machinist scale

Identify and read vernier protractor

Identify and use mill file

Comprehend a sequence sheet

HORIZONTAL SHAPER

Enabling Task for

COMPETENCY NO. 4

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 6" vernier protractor

Identify and read level protractor

Identify, set up, and read dial indicator

Identify and use 10" flat file

Identify and follow sequence sheet

Identify and follow blueprint

LEVEL I

GRINDING MACHINE

Enabling Tasks for

COMPETENCY NO. 1

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 0-1" micrometer

Identify and read a dial indicator

Identify and use an angle plate

Identify and read a height gage

Identify and use clean shop towel

Identify and use mill file

LEVEL II

SURFACE GRINDER

Enabling Tasks for

COMPETENCY NO. 2

Identify and measure stock

Identify and read 6" vernier calipers

Identify and read 0" to 1" micrometer

Identify and use precision square

Identify and read vernier protractor

Identify and use small angle vise

Identify and use flat mill file

Identify and understand how to obtain a 32 finish

LEVEL III

SURFACE GRINDER

Enabling Tasks for

COMPETENCY NO. 3

Identify and measure stock

Identify and read 6" machinist scale

Identify and read 0" to 1" micrometer

Identify and use precision square

Identify and use mill file

Comprehend a sequence sheet

LEVEL IV

SURFACE GRINDER

Enabling Tasks for

COMPETENCY NO. 4

Identify and read 1" to 2" O.D. micrometer

Identify and use precision square

Identify and read height gauge

Identify and use dial indicator

Identify and use 5" size bar

Identify, figure, and use gauge blocks

Identify and use small angle vise

Identify and know how to obtain 32 finish

Identify and use flat mill file

X. RECOMMENDED STUDENT COMPETENCY RECORD

INDIAN HILLS COMMUNITY COLLEGE

RECOMMENDED STUDENT COMPETENCY RECORD

STUDENT NAME: DEPT. OF:

EVALUATOR: DATE:

COURSE NAME UNIT:

COMPOSITE SCORE POSSIBLE SCORE

PROCESS: PRODUCT:

ITEM	TOTAL	FACTOR	SP	S	U				ITEM	TOTAL	FACTOR	SP	S	U
Was suggested speed and feed followed? Was cutting oil used? Was drill spindle adjusted for proper handle level? Was part blocked or loaded in vise so it would not spin with the drill? Were safety instructions observed?									Were print dimensions held? Was standard drill hole tolerance held? Were sharp edges removed?					
SUB SCORE									SUB SCORE					

COMMENTS

INDIAN HILLS COMMUNITY COLLEGE

RECOMMENDED STUDENT COMPETENCY RECORD

STUDENT NAME: DEPT. OF:

EVALUATOR: UNIT:

COURSE NAME: UNIT:

COMPOSITE SCORE: HIGHEST POSSIBLE SCORE:

PROCESS PRODUCT

ITEM	TOTAL	FACTOR	SP	S	U	ITEM	TOTAL	FACTOR	SP	S
Was sequence followed?						Were dimensions held within print tolerance?				
Was machine operated in safe manner?						Were turned finishers held to reasonable smoothness?				
Were tools placed in a clean area?						Was part faced off square?				
Were recommended feed and speeds used?						Was shoulder faced square?				
Was turning tool properly centered?						Were sharp edges removed?				
SUB SCORE						SUB SCORE				

COMMENTS: SP - SUPERIOR
S - SATISFACTORY
U - UNSATISFACTORY
If highest possible score is 88 and sub scores total 80 on actual then subtract (80 from 88 = 8) 88 equals 100% minus 8 = 92% actual grade. Both superior columns multipled times the factor will give the highest possible score or 100 percent.

XI. JOB OPPORTUNITIES

JOB OPPORTUNITIES

Many of the competencies listed in this booklet lead to jobs that are available in the 10 counties served by the 26 Local Education Agencies and Indian Hills Community College in Southeastern Iowa. Students, teachers, and counselors may use the following information in designing course emphases for more effective instruction and counseling.

MACHINE SHOP

604.685.026	Lathe Operator, Production
603.685.062	Grinder Operator Production
605.685.030	Milling Machine Operator, Production
606.685.014	Drill Press Operator
605.282.014	Planer Set-Up Operator, Tool
605.382.038	Shaper Set-Up Operator, Tool

END

DEPT. OF EDUCATION

NAT'L INSTITUTE OF EDUCATION

ERIC

DATE FILMED

MARCH

22 - 1985